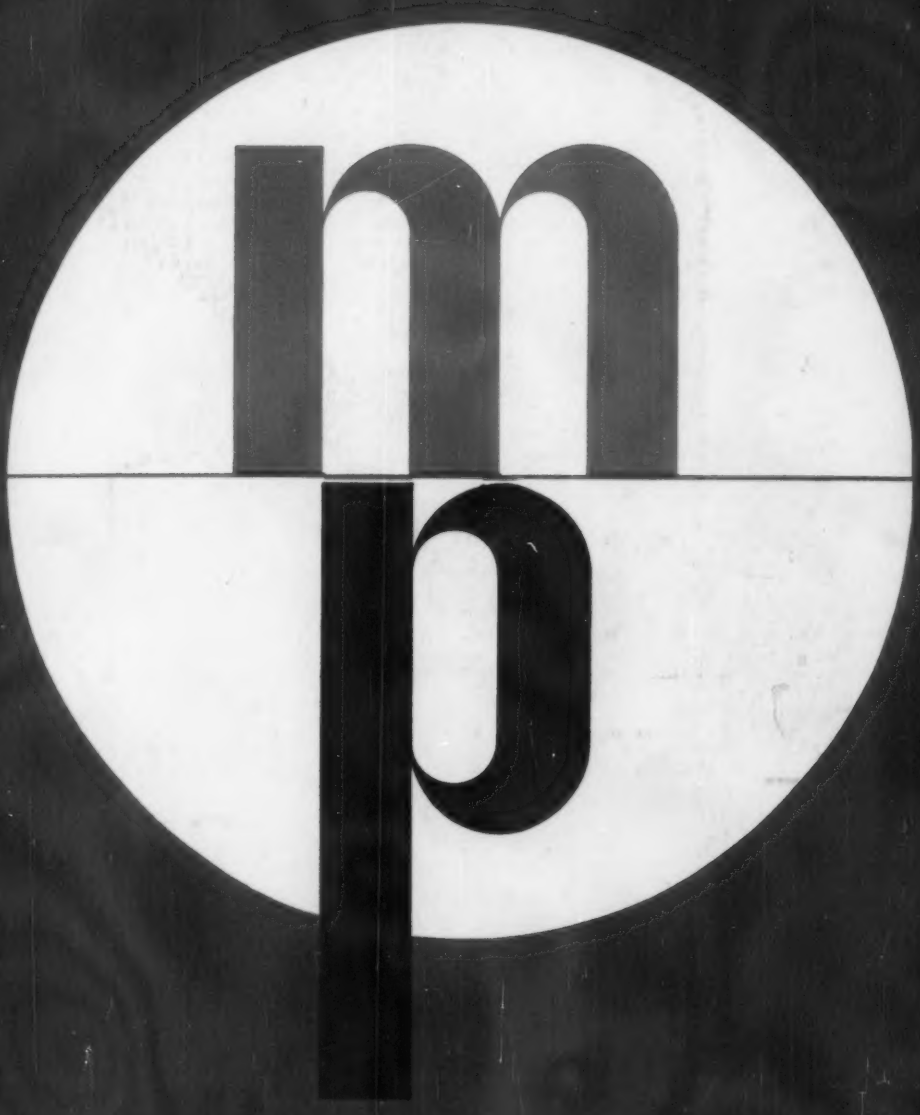
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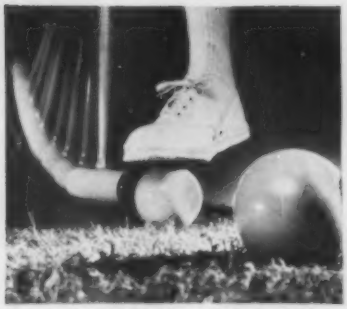
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page 105 **What's new in design for handles?**

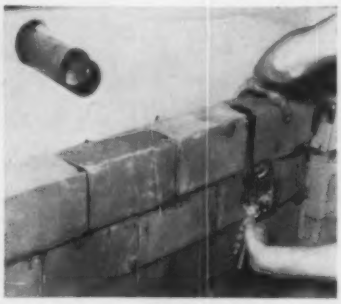
page 120 **New study of reinforced pipes**

page 143 **Engineering the plastics "House of the Future"**

for these **important properties** in your products . . .



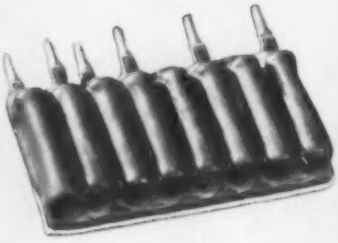
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Heat Resistance of resins gives foundry shell molds hot strength sufficient for metal casting production.



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MODERN PLASTICS*

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Editorial

Lesson in low profits

With first quarter 1957 profits of some 536 companies up about 7.8% over earnings for the same period last year, as reported by the *Wall Street Journal*, the fact that the 23 chemical companies concerned in this group reported profits down 1.3% is worth noting, particularly by industrial management—and by securities analysts.

And the profit prospects for the plastics part of the chemical industry should be studied most carefully along with the profit picture of industries which compete with plastics.

It is obvious that the cost-price squeeze has removed the "cream" from plastics as well as other chemicals, when larger sales can result in lower profits. It is also obvious that the aluminum and steel companies, through vast expansion, have overtaken demand in those types of materials which compete with plastics and are already engaged in huge promotional drives for more business. It is further obvious that some of the plant expansion in plastics may not be properly profitable at lower price levels. And finally, it is obvious that any slackening of sales in home appliances, automobiles, and construction will reflect in markets for plastics.

This admittedly non-rosy picture of the presently developing situation in plastics in competition is not without its bright side—provided certain things are done by the plastics industries, by every individual in these industries, and in some cases by their financial advisors.

First, let the money markets be soundly advised that, while plastics will be profitable in the future, they will not likely be as profitable in terms of either return on invested capital or profit on sales as they have been in the past.

Second, the plastics industries must now engage in much more extensive (and therefore expensive) promotional programs in those market areas where non-plastics materials are spending promotion money.

Third, let present monomer and polymer processing plants be re-engineered with a view to lower break-even costs and let no new plants be built in which enough attention is not paid to the long-range economy of processes.

Fourth, since plastics are versatile materials, every advantage must be taken of these qualities so that when some fields of end-use are down and others up in volume, plastics' share of the total will continue to grow.

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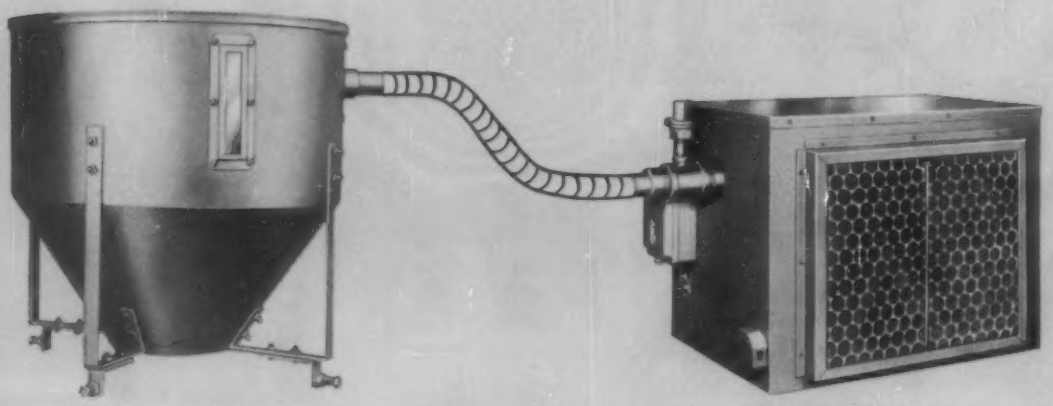
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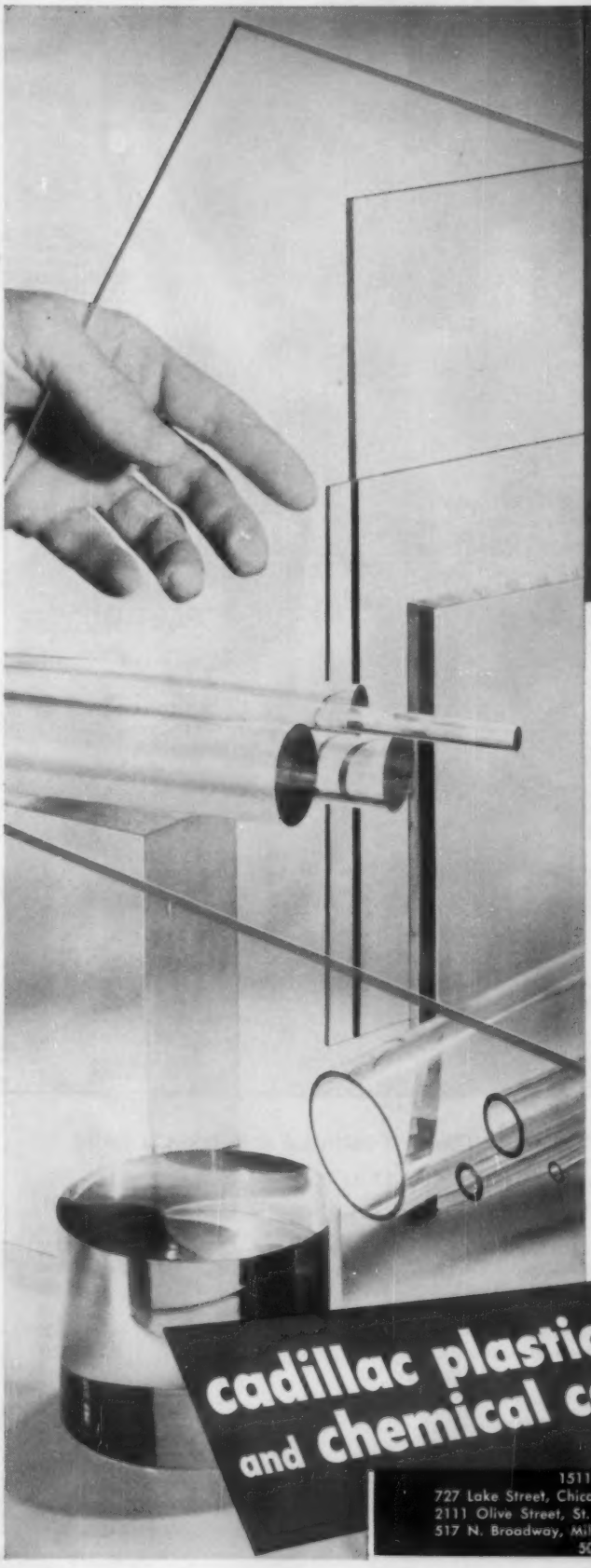
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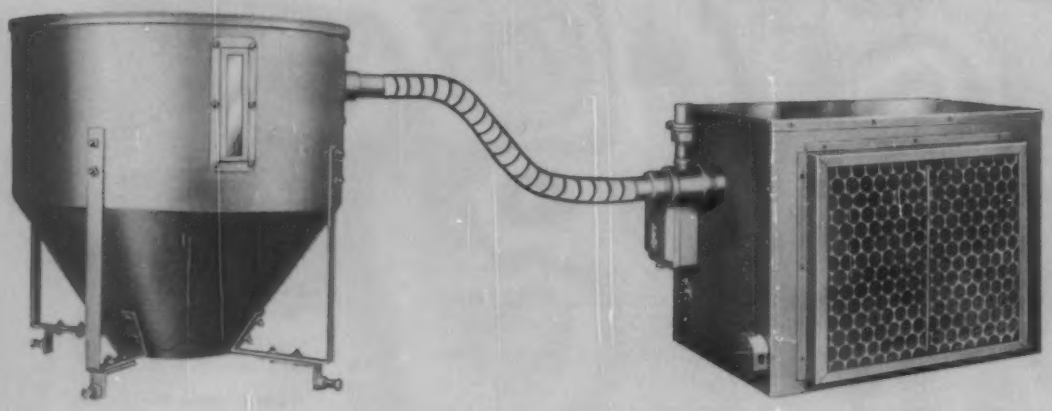
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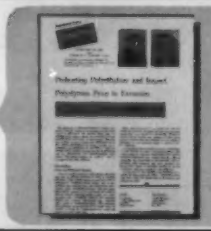
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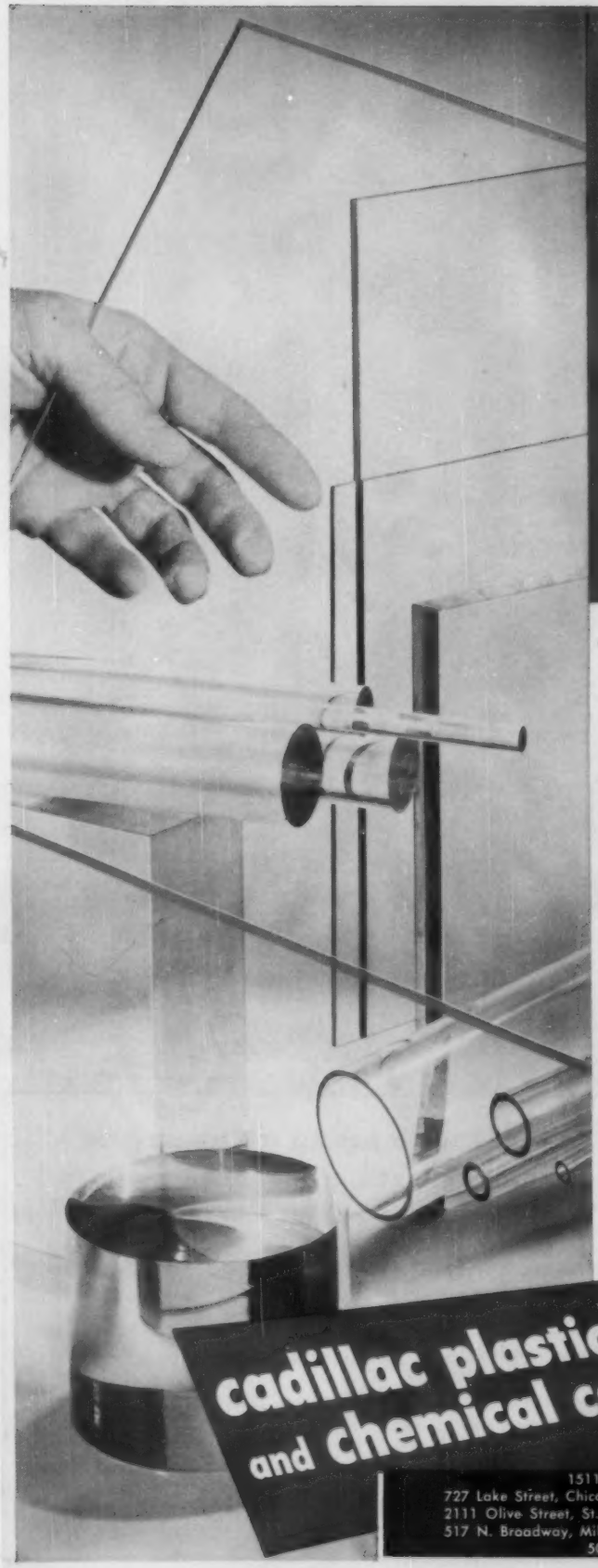
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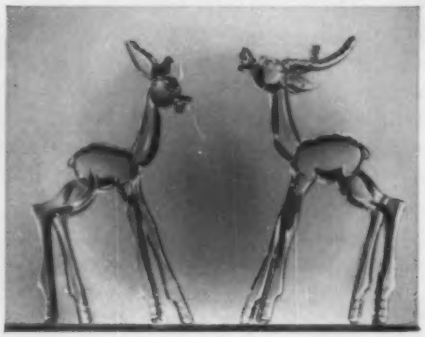
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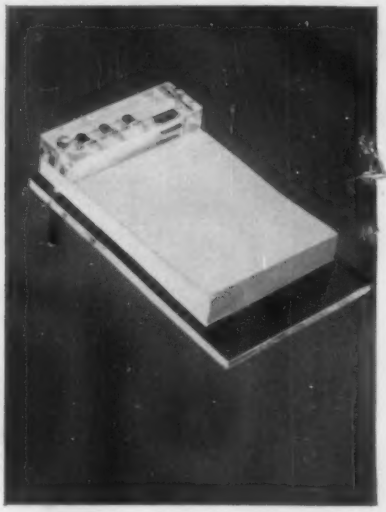
CONTROL PANELS for these colorful new washers and dryers are molded of crystal clear Du Pont LUCITE. LUCITE acrylic resin is about one-third the weight of glass and has relatively high impact strength. Chemically resistant, LUCITE is unaffected by soap or detergent solutions . . . retains its sparkling, attractive appearance. (Control panels made for the Home Laundry Dept., General Electric Company, Louisville, Ky.)



LIGHTING FIXTURES of LUCITE transmit optimum light without specular glare or shadow. They are durable, free from discoloration and dimensionally stable. Light in weight and remarkably strong, fixtures of LUCITE are easy to install and maintain. (Fixtures of LUCITE for National Housing Center, Washington, D. C., by Smithcraft Lighting Div., Chelsea, Mass. LUCITE molded by Mack Molding Co., Arlington, Va.)



FIGURINES made of LUCITE make attractive decorations. Easily molded into complex shapes, LUCITE acrylic resin provides opportunities for unusual designs. Because of its remarkable optical properties, interesting "edge lighting" effects may be achieved with LUCITE. (Buck and doe set manufactured by Byrd Plastics, Inc., Erie, Pa.)



DESK PAD made of LUCITE acrylic resin serves as a stimulating sales-promotional piece. Company's name is attractively set in sparkling-clear LUCITE. For further effectiveness, product replicas may be embedded permanently within LUCITE. (Desk pad of LUCITE manufactured by Clearfloat, Inc., Attleboro, Mass., for The Upjohn Company, Kalamazoo, Michigan.)

of Du Pont LUCITE®
an added sales attraction



SLIDE-VIEWER LENS made of LUCITE has optical properties comparable to those of the finest glass. LUCITE acrylic resin affords extremely high light transmission and provides outstanding lenses for a wide variety of applications. (Lenses and viewer molded and manufactured by Craftsmen's Guild, Hollywood, California.)



AUTO COMPASS has a crystal-clear lens made of LUCITE. The lens is molded of two hemispherical shells of LUCITE heat-welded together. It is filled with a clear liquid for damping the compass movement. This lens of LUCITE will stay bright and attractive for years, resisting aging, moisture and sunlight. (Auto compass molded by General Industries Co., Elyria, Ohio, for Hull Manufacturing Co., Warren, Ohio.)



ELECTRIC SHAVER for women is exquisitely styled in sparkling, durable LUCITE acrylic resin. Attractively back-painted, the molded housing is a typical example of beauty and functional design achieved with LUCITE. (LUCITE molded and decorated by Hoosier Cardinal Corp., Evansville, Ind., for Schick, Inc., Lancaster, Pa.)

Economical, beautiful and durable, Du Pont LUCITE is being adapted to an ever-increasing variety of applications, both decorative and functional. LUCITE is used either clear or in a wide range of colors to beautify such items as household appliances, personal articles, jewelry and ornaments. In industrial applications, the strength, toughness, transparency and resistance to chemicals of LUCITE provide functional advantages.

An improved formulation of LUCITE 140 has been used commercially for nearly a year for molding heat-resistant parts. Customers report that LUCITE 140 has increased flow at usual molding temperatures, which allows lower ram pressures and in many cases permits easier ejection from the mold, smaller gates and more economical trimming.

The thermal stability of LUCITE 140 permits molding temperatures from 30°F. to 50°F. higher than molding powders previously available which provided parts of comparable service temperature. This means that an even further increase in flow is possible by using cylinder temperatures not hitherto practical for the molding of heat-resistant parts. The improved processability is achieved without sacrifice of brilliance or durability. Parts actually show slightly higher service temperature than parts from other acrylic molding powders.

• • •

Why not investigate the advantages of LUCITE for yourself? For property and application data, simply clip the coupon.

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In Canada: Du Pont Company of Canada (1956) Limited, P. O. Box 660, Montreal, Quebec

Please send me more information on Du Pont LUCITE acrylic resin.

I am interested in evaluating this material for _____

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Position _____

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We carry the following plastic in stock—for all your immediate needs!



PLEXIGLAS
Standard Type II UVA
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Acrylic sheet
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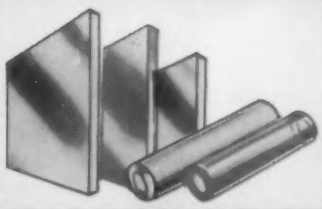
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ACETATE BUTYRATE
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Natural—Colored

POLYETHYLENE
.015 thru .125 thicknesses
Large Sheets

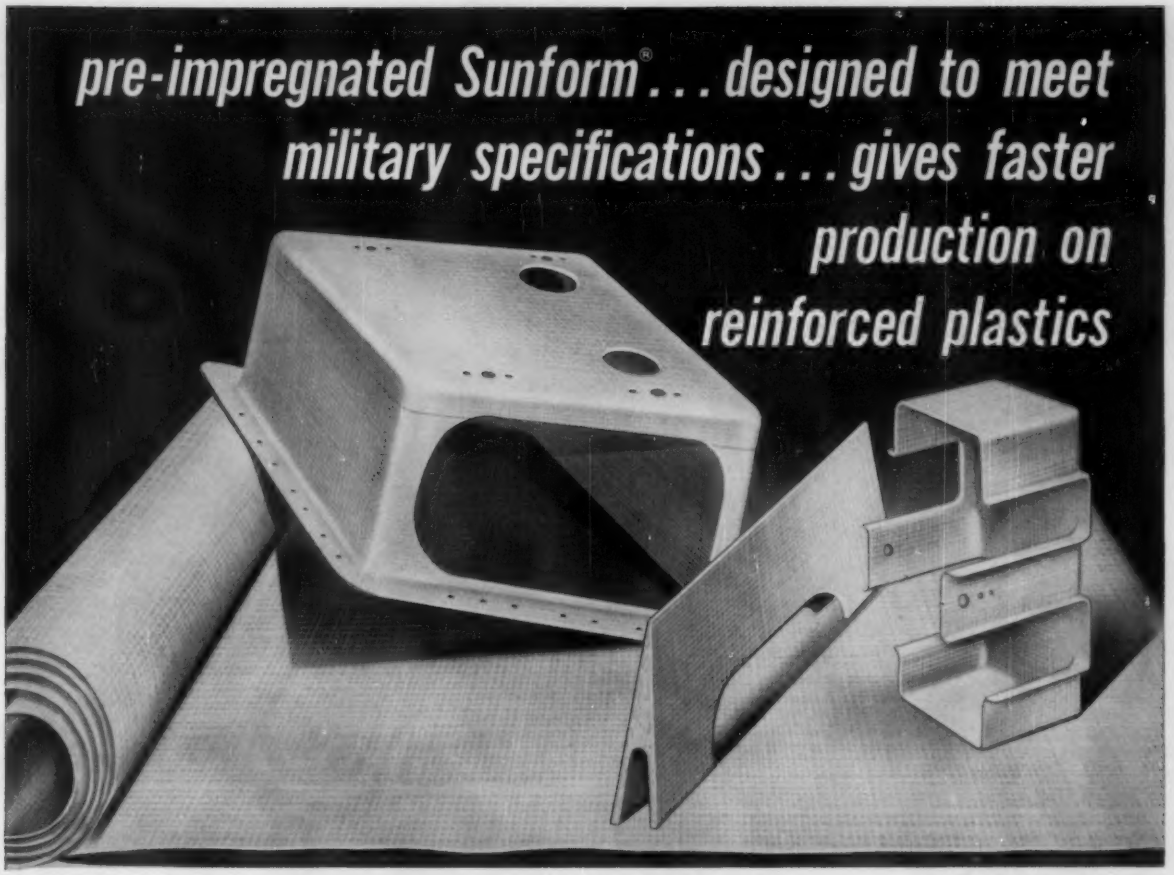


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Available at low cost and in widths over 100 inches

Recent developments have resulted in new SUNFORM formulations and a new polyester resin that substantially lowers cost while maintaining the same high specifications. In addition to Sunform polyester, pre-impregnated materials using epoxy, phenolic, melamine and silicone resin systems, as well as custom impregnations for low pressure laminating work, are also available.

SUNFORM is uniformly pre-impregnated with resin plus catalyst, yet it unrolls ready to mould and lays-up like plain cloth. This easy lay-up saves time and money. Controlled resin impregnation means fewer rejects, no delamination during machining, void-free laminates with multiple layers (even on intricate shapes). Reinforced plastics made with SUNFORM have high tensile and flexural strengths, exceptional stability even under extremes of temperature and humidity. Dielectric strength is high, loss factor is low and moisture resistance is excellent.

SUNFORM is resistant to mild acids, alkalies, common solvents, rot, mildew, fungus. SUNFORM polyester has a shelf life of six months. Can be stored at room temperatures . . . no refrigeration required.

SUNFORM polyester cures in 2 to 5 minutes at 240°F to 280°F—low pressure. Suitable for all types of low pressure molding (matched dies, vacuum bag, pressure bag or contact pressure). Available in Fire Resistant, Regular or special Heat Resistant types. Selection of colors (large orders) and a variety of glass cloth weaves and finishes from .003″ to .090″.

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Vista Vinyl made by Harte & Co., Inc., New York, N. Y.—Manufacturers of famous Watasenl Vinyl Film.

Vista Vinyl, Watasenl—T.M.'s Harte & Co., Inc., New York, N. Y.

fluorescence, too

Coming off the calender at left is a doubly new kind of vinyl film, called Vista Vinyl. Its first mark of distinction is a striking, three-dimensional appearance. Its second outstanding characteristic is a never-before-achieved fluorescent color.

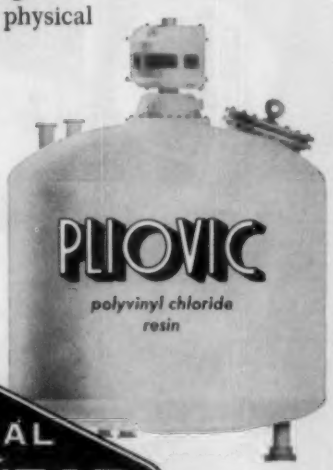
The three-dimensional effect is obtained through a unique method of embossing which takes into consideration Fresnel's theory on the absorption and reflection of light. The distinctive color is achieved through extra-careful compounding and processing of the heat-sensitive fluorescent pigments.

A major role in the successful production of this unusual film is played by PLIOVIC. Because it is dry blending and fuses at a relatively low temperature, PLIOVIC processes readily to minimize the effects of heat degradation on both resin and pigment. It also embosses easily and sharply and provides excellent heat sealability. And these processing advantages are accompanied by good heat and light stability plus good, general physical properties.

The particular PLIOVIC used in this three-dimensional film is one of a family of vinyl resins designed to give you improved processing and/or end properties. Included in the current line are resins of both the dry-blending and heat-mixing type which display definite advantages in the calendered, extruded, electrical and dispersion fields—and more are on the way.

A simple way to keep posted on the PLIOVIC resins is to be sure you are getting the latest *Tech Book Bulletins*. They're yours, just by writing to:

Goodyear, Chemical Division, Akron 16, Ohio.



PLASTICS DEPARTMENT

CHEMICAL GOODYEAR DIVISION

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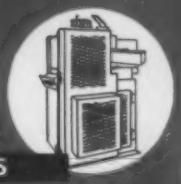
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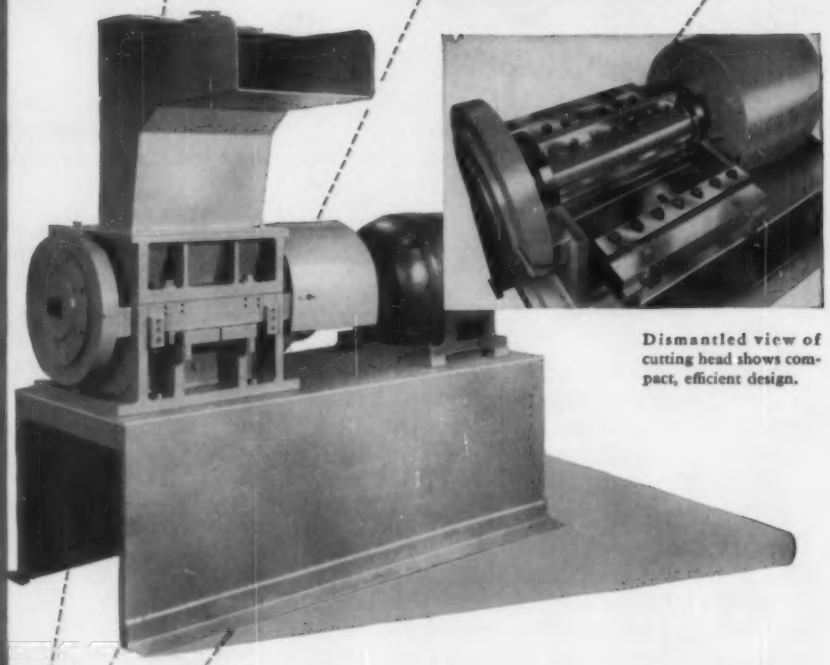
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MODEL 20 All Steel Granulator

CUSTOM ENGINEERED QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

1 HEAVY DUTY — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

2 LARGE THROAT OPENING — 8 by 20″ size.

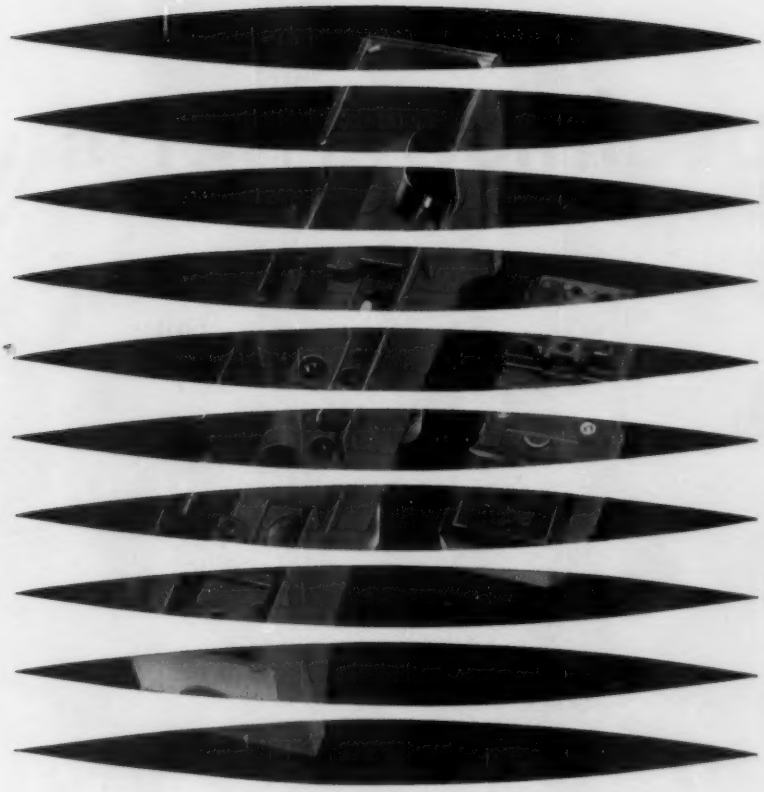
3 PRIOR BANDSAWING NOT NEEDED — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

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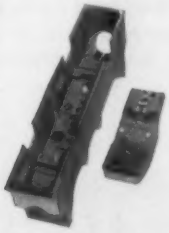


how expensive are molds for plastic parts...really?

Take another look at this part. It has been in production over a period of thirty years . . . and not one cent has been charged to the customer for mold repairs! This molding which Kurz-Kasch has furnished Bulldog Electric Products Co. by the thousands since 1927, is excellent proof that *paying enough at the outset* for the right molds is a real bargain.

Sure, good molds cost money initially. But it's an unvarying policy at Kurz-Kasch to design and build original molds for easy repair, so that we—not the customer—pay the bills for mold maintenance.

For a quote you can depend on . . . to give you lowest final cost per part . . . call Kurz-Kasch.



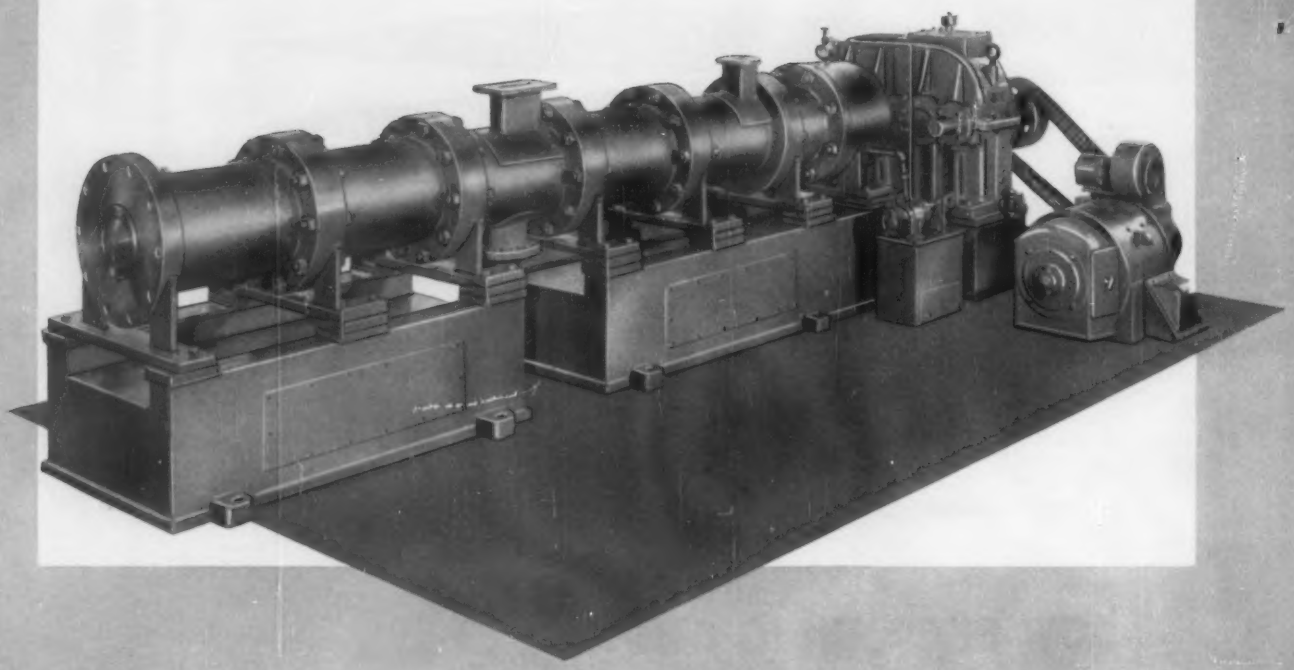
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Specials... THAT'S US



The 8" extruder illustrated fits into a special processing line. Custom designed for a large chemical company, the extruder had to be designed to coordinate with existing processing, blending and mixing facilities.

Extruders for standard operations can be off-the-shelf models but new processes, new products, new ideas require specific designs. For example, in the processing of polyethylene, we developed special extruders for simultaneous hot and cold feeding. In the fields of foamed plastics, polystyrene, polyethylene, the vinyls, we have designed many individual extruders for processing, blending, reclaiming and devolatilizing.

Most new ideas for special equipment originate in shirt-sleeve sessions with a company's production and engineering personnel. They know their process requirements. We translate these specifications into machines tailored to the job.

If you are working on new ideas in either plastics or rubber, H & K can be of assistance. We have specialized knowledge of these fields and can design a complete plant, a special process or an individual machine. We also have complete engineering service.

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For prompt response, please address your inquiry to:

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Joseph Davis Plastics

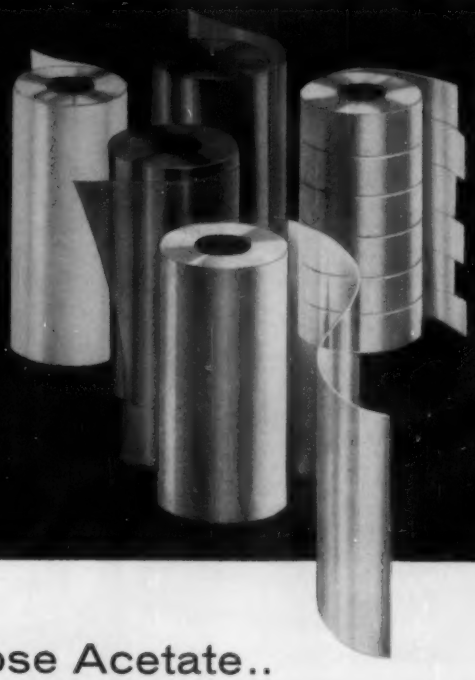
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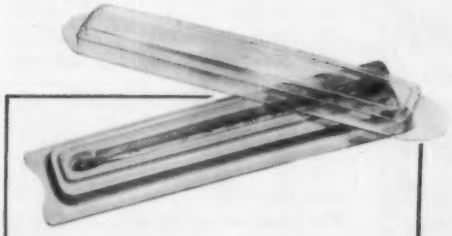
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Here's practical, protective visual display packaging for a clinical thermometer. The bottom part is vacuum formed of .0075 gauge JODA white acetate. The top is vacuum formed of .0075 gauge JODA crystal clear acetate. Made by

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CUT YOUR REJECT RATE WAY DOWN with These 3 All Purpose Mold Lubricants

- EASIER
- QUICKER
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★ Silicone type mold releases have been pinpointed as the cause of crazing and stress cracking of polyethylene film and molded articles. IMS Neutral Oil Spray contains NO Silicone and is specially developed for polyethylene processors.

NEW



For polyethylene and other applications where Silicone may be objectionable, IMS now offers

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Only IMS gives you a choice of THREE distinct types of parting agents all conveniently packaged in Aerosols, to cover all molding conditions.

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Sample Can	$ 2.00
Per Unbroken Dozen	18.00
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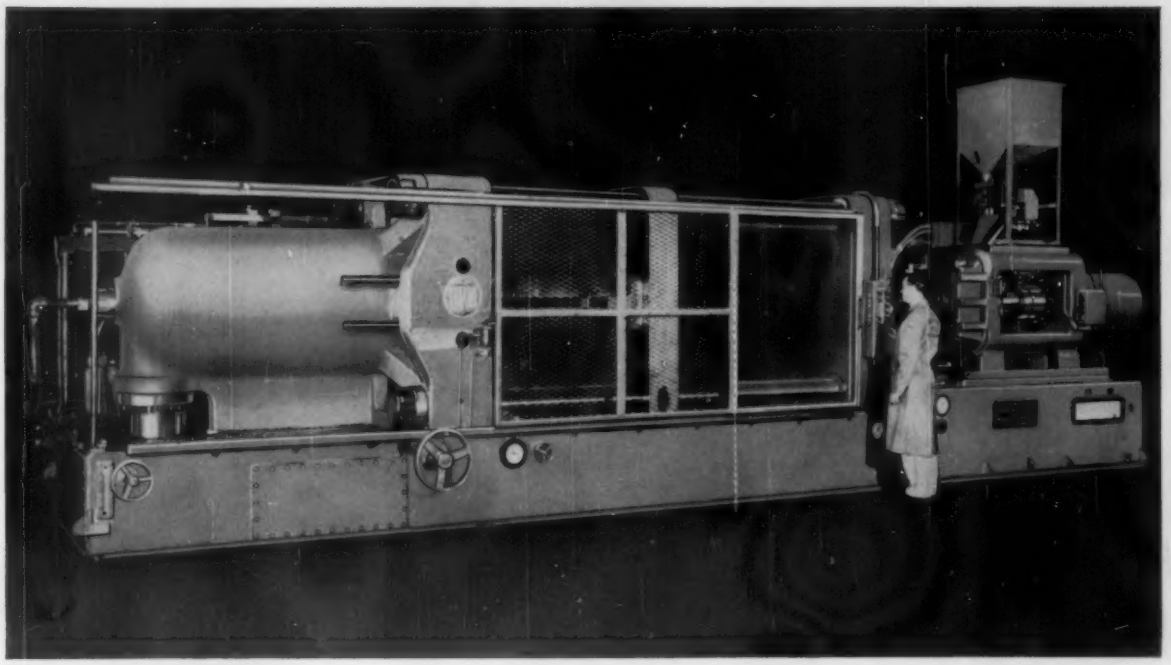
Sample Can	$ 2.00
Per Unbroken Dozen	13.80
Per Unbroken Gross	144.00

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Yes, here's a machine designed specifically for molding big area, deep parts, but easily adapted to normal molding jobs. It's versatile, fast and built to take continuous heavy-duty service. Clamping pressure, stroke and mold mounting space are more than ample for those big jobs.

Take a look at these specs:

Daylight	104"
Clamp Stroke	60"
Mold Mounting Space	48"x 60"
Clamp Pressure (tons)	1200

It will pay you to look into this machine at your earliest opportunity. It can bring you more than your share of the big area, deep part business which is becoming so active in the houseware, appliance and automotive industries. Write, or phone today for more complete information.

HPM

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• Cooking utensils take a beating. They're constantly subjected to the wearing effects of bangs and slams...stove heat...boiling water...food acids. That's why they have to be built extra strong—like the Quaker Maid electric fry pan.

In fact, the plastic handle of this pan required special treatment, because it serves as both handle and electrical housing.

Inserts had to be positioned just right, providing insulation where needed, and allowing for free play of mechanical sections.

Because of these rigid requirements, Quaker Industries, of Silver Creek, New York, called on Norton to do the job.

Norton engineers decided on a phenolic transfer molding, to provide the required combination of utility and attractiveness.

for a completely Norton **assembled** product



Besides molding the handle, Norton assembled all the components—body, handle, heating element, cord and cover—into finished, ready-to-use fry pans.

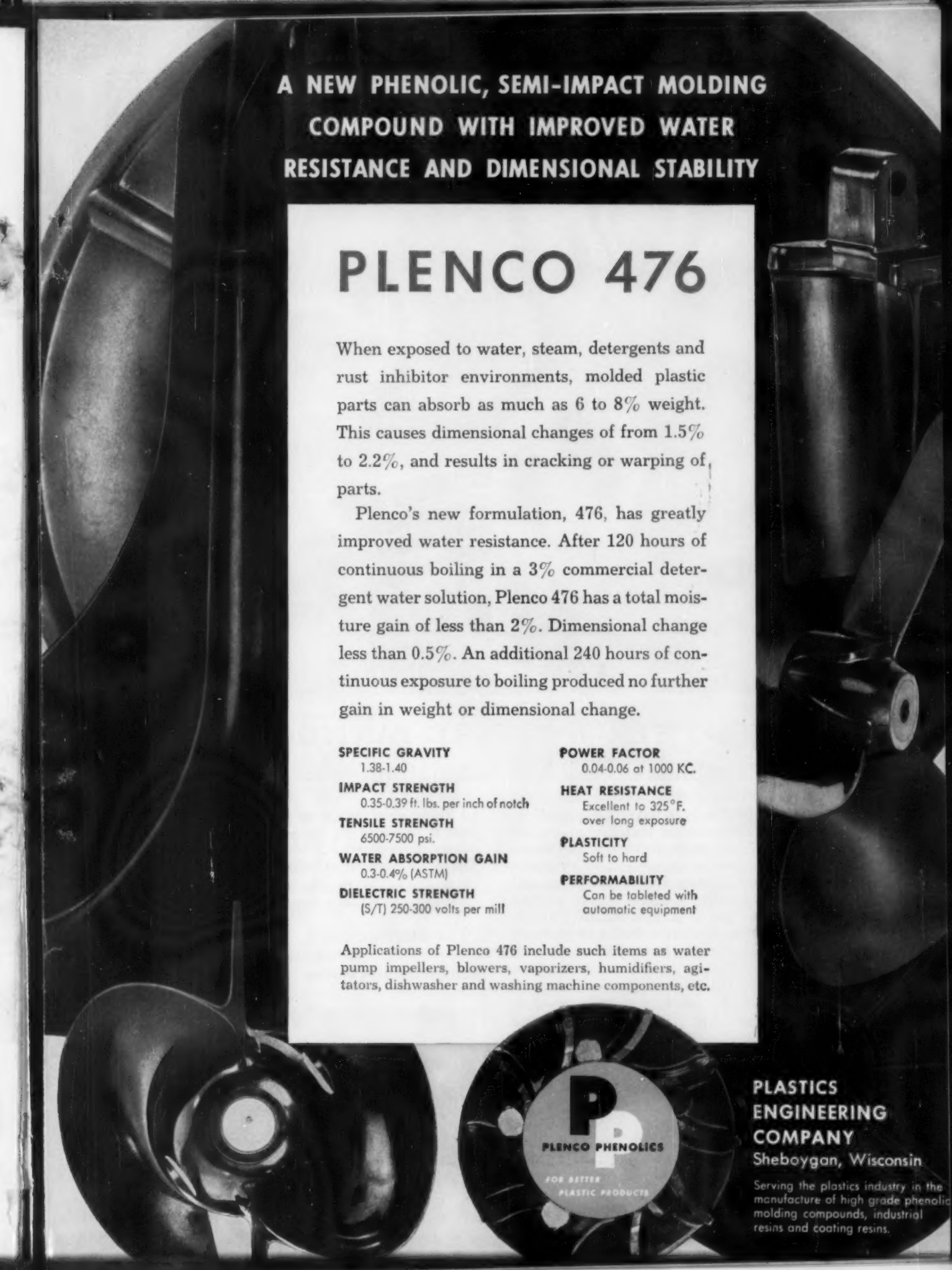
This additional operation illustrates just how flexible the Norton organization is.

Our personnel, equipment, and know-how can be readily adapted to handle all the steps in a *complete* project. That's why we're so often called on to process jobs involving multiple assemblies.

NORTON *Laboratories, Inc.*

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A NEW PHENOLIC, SEMI-IMPACT MOLDING COMPOUND WITH IMPROVED WATER RESISTANCE AND DIMENSIONAL STABILITY

PLENCO 476

When exposed to water, steam, detergents and rust inhibitor environments, molded plastic parts can absorb as much as 6 to 8% weight. This causes dimensional changes of from 1.5% to 2.2%, and results in cracking or warping of parts.

Plenco's new formulation, 476, has greatly improved water resistance. After 120 hours of continuous boiling in a 3% commercial detergent water solution, Plenco 476 has a total moisture gain of less than 2%. Dimensional change less than 0.5%. An additional 240 hours of continuous exposure to boiling produced no further gain in weight or dimensional change.

SPECIFIC GRAVITY
1.38-1.40

IMPACT STRENGTH
0.35-0.39 ft. lbs. per inch of notch

TENSILE STRENGTH
6500-7500 psi.

WATER ABSORPTION GAIN
0.3-0.4% (ASTM)

DIELECTRIC STRENGTH
(S/T) 250-300 volts per mil

POWER FACTOR
0.04-0.06 at 1000 KC.

HEAT RESISTANCE
Excellent to 325°F. over long exposure

PLASTICITY
Soft to hard

PERFORMABILITY
Can be tableted with automatic equipment

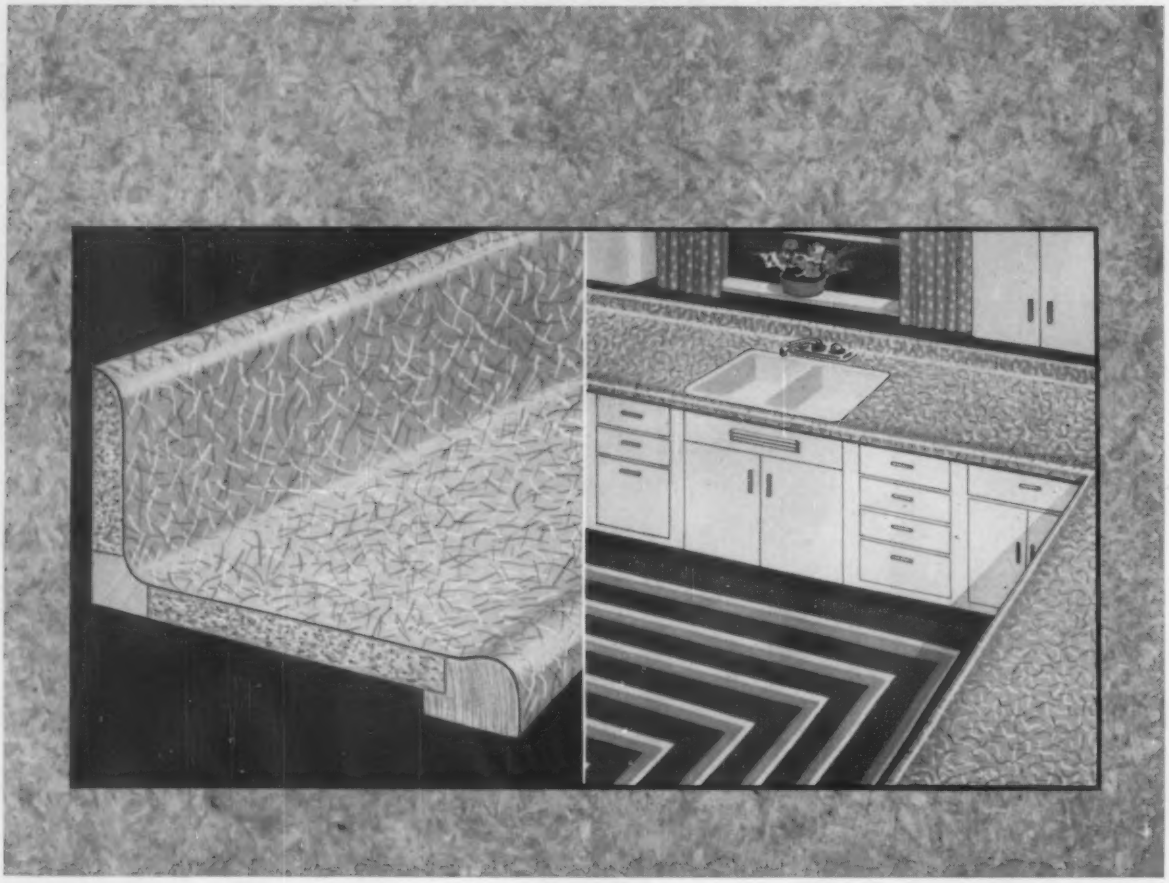
Applications of Plenco 476 include such items as water pump impellers, blowers, vaporizers, humidifiers, agitators, dishwasher and washing machine components, etc.

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FOR BETTER PLASTIC PRODUCTS

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Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

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WEYERHAEUSER 4-SQUARE PARTICLE BOARD—
simplifies the job of laminating, veneering

No KNOTS, no grain! Ready to use without sanding, drying, planing! Dimensional stability plus good bonding quality! Uniformity in density, thickness, smoothness! These are the characteristics that help make a better base for sink and counter tops and other products requiring a stable, easily worked core. Now you can get them in 4-Square Particle Board, the Weyerhaeuser-engineered core material for decorative laminated plastics and wood veneers.

4-Square Particle Board is produced in densities for both 3 and 5 ply laminations. Laminations may be mounted using either pressure or pressure sensitive adhesives. Sanded smooth on both sides and completely free of grain and knots, 4-Square Particle Board helps give you the smooth, attractive surface that means customer satisfaction, increased sales.

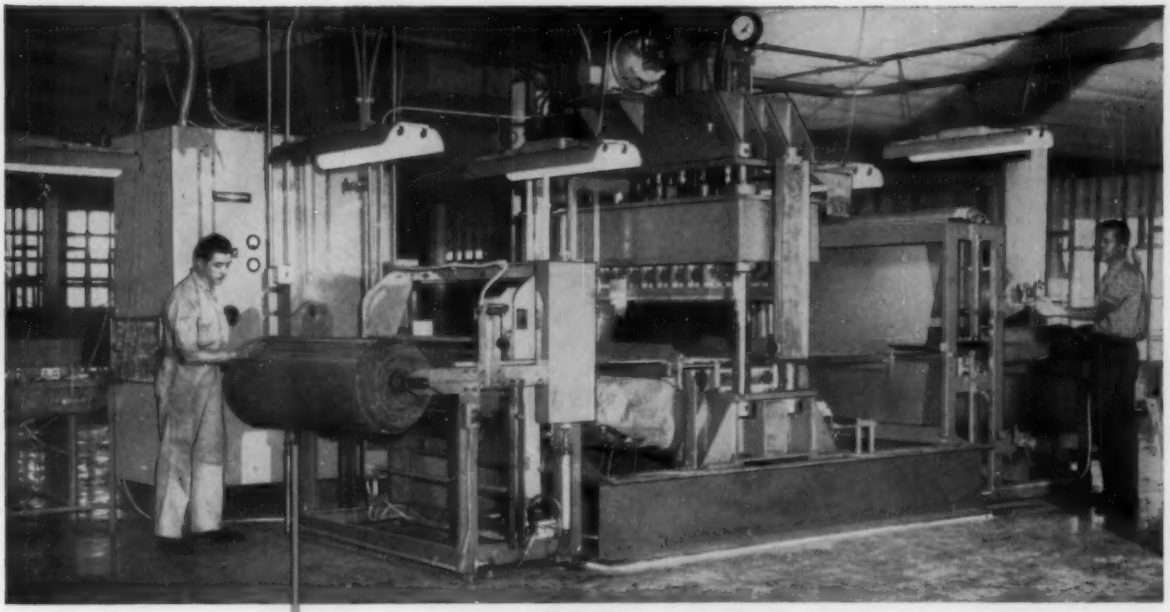
Consider the many places this improved core stock can bring extra savings and profit . . . in warp-resistant sliding doors; in beautifully finished dresser, table and dinette tops; in close fitting, well machined fixtures and parts. We think it will pay and pay well to investigate its use in your products. You may find it presents an immediate answer to current needs or problems. Thicknesses from $\frac{3}{8}$" to 1". Densities from 30 to 50 lbs. per cubic foot.

Weyerhaeuser offers Hardboards, too . . . to meet a wide range of needs. Write for descriptive literature.

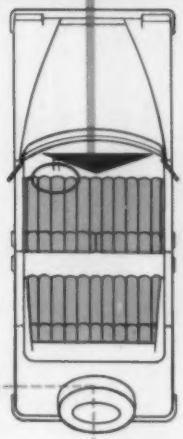
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Write for sample

Check the smooth surface and uniform texture that help insure better manufacturing results. Write today for free sample plus new folder titled, "Basically Better".



At the Masland Duraleather plant in Philadelphia, sheets of Masland Duran vinyl plastic are electronically welded to a backing, producing a handsome quilted upholstery fabric for automobiles and other uses. The work is done by a large, completely automated Thermatron press in conjunction with a Thermatron generator and indexer. Full rolls of plastic are fed into the press, quilted and rewound in one continuous operation with only supervisory operators.



America's newest cars owe so much to plastics welded by

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HIGH FREQUENCY SEALING AND HEATING EQUIPMENT

Electronically welded plastic products for the automotive industry include . . .

- Door panels
- Upholstered seats
- Safety cushioning
- Convertible tops
- Reservoir bags for windshield wipers
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- Visor pouches
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- Carburetor filters

You've admired that attractive upholstery in many new cars. It's vinyl plastic, weld-quilted by Thermatron equipment. Then there's the safety cushioning of the sun visors and dashboards. Thermatron does that too—welds and shapes the foam filled visor for more shock resistance.

Because of Thermatron, plastics have become an important part of modern automobile design, and the applications are unlimited. If *you* have a new plastic product in mind, our engineers will be glad to run tests on your own material and make suggestions. Write today to Dept. 114.

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There is NO GUESSWORK involved — and it COSTS YOU LESS.

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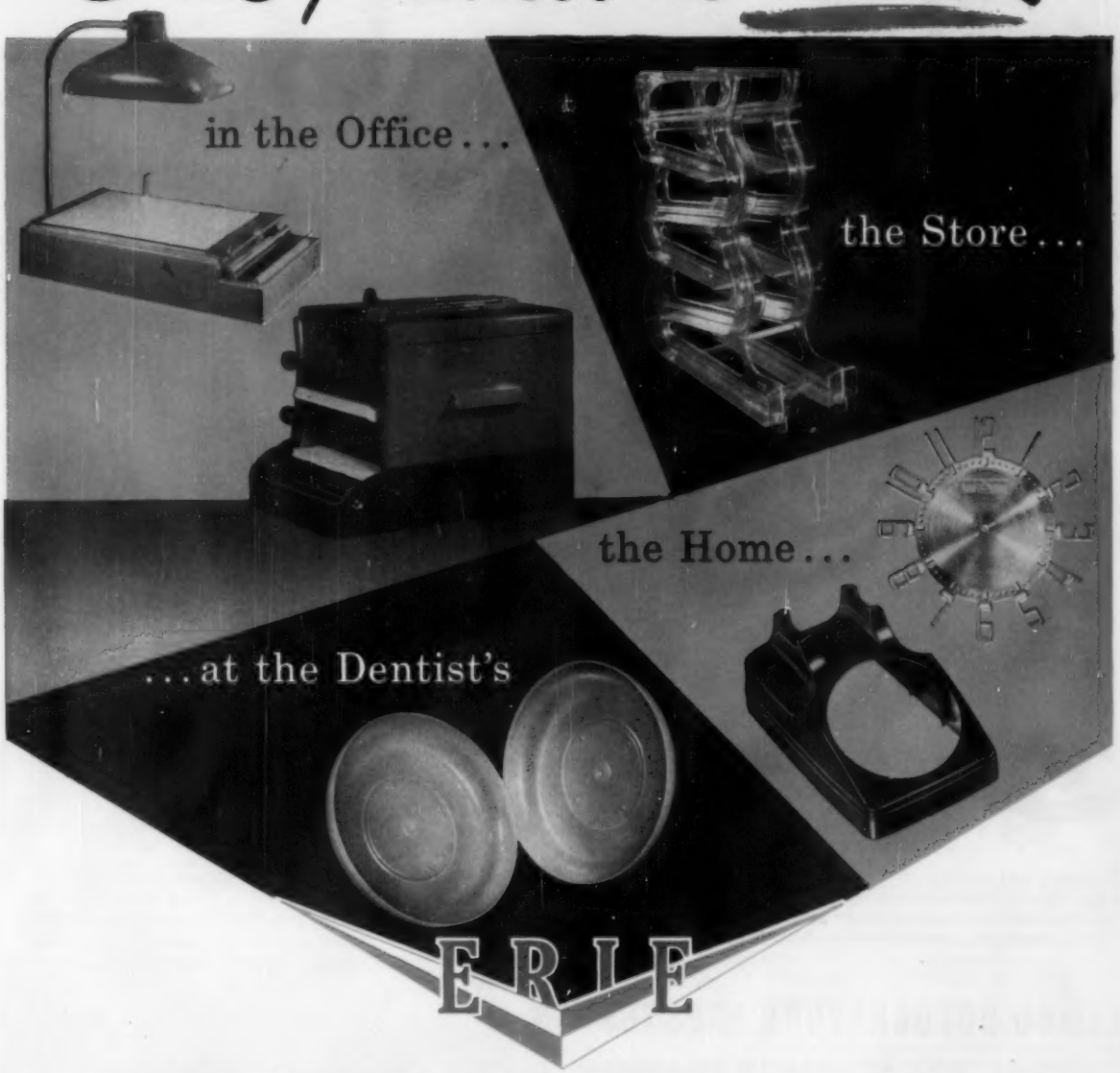
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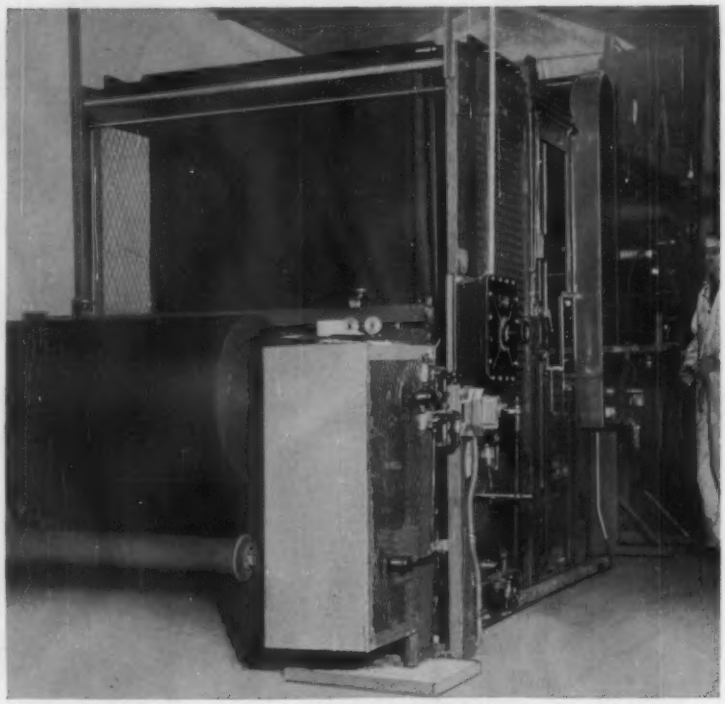
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Compact, and costing only a fraction of mammoth equipment usually performing these jobs, it is especially practical for both short or long runs.

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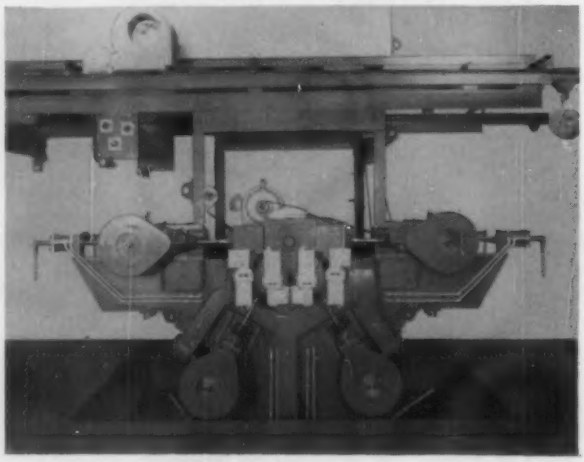
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CUT DOWN SHUT DOWN! Hydraulic pressure on printing nips** permits operator to simultaneously back away all nips. Engraving rollers keep turning even while the printing machine is stopped. Ink doesn't dry on rollers. No wash-up needed. *Motorized Register Control* permits registry by operator from one position at panel board. Available, also, with electric eye.

Printers of all unsupported and supported plastic film prefer fast, quiet Lembo Rotogravure Presses for perfect, strain-free, in-register printing at speeds to 125 yards per minute. Shown right, 4-color – 52" between printing nips. Also, 6-color – 60" between nips.

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In addition to their present importance as solvents for compounding and finishing plastics, the Nitroparaffins are a source of many polyfunctional molecules of interest in the manufacture and improvement of plastics.

Trained technical representatives may be reached at any CSC sales office for work on your specific product or processing problems. Or, write for specific application information, technical data sheets and samples.



Versatile NP's and Derivatives In Large-Scale Production

VINYL RESINS AND COPOLYMERS: *Nitroparaffins* — Are good solvents for polyvinyl acetate and many of the vinyl chloride-acetate polymers. They have the advantage over the ketones of allowing higher solids content at no increase in cost. Also, there is less solvent retention in the film where Nitroparaffins are utilized and much less of an odor problem. *Nitromethane* in the presence of toluene is the most powerful solvent of the group.

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UREA-FORMALDEHYDE RESINS: *2-Amino-2-methyl-1-propanol (AMP)*— Used as a stabilizer for urea or melamine formaldehyde finishes.

2-Amino-2-methyl-1, 3-propanediol (AMPD) — Used as a catalyst for making urea-formaldehyde resins.

ALKYD RESINS: *2-Amino-2-methyl-1-propanol (AMP)* — Viscosity stabilizer in alkyd finishes containing urea-formaldehyde or melamine resins.

Tris Amino — Potentially useful in manufacture of alkyd resins.

CELLULOSE ACETATE BUTYRATE: *Nitroparaffins* — The only satisfactory medium-boiling solvents for some grades of cellulose acetate butyrate.

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MISCELLANEOUS: *Alkaterge-C* — As a mold lubricant in the molding of plastics. Excellent grinding assistant for hard resins, and as an antifoam agent in polyethylene coating compositions.

Nitrohydroxy Compounds — As hardening agents for proteins such as casein. They are slower gelling than formaldehyde or glyoxal. *Tris Nitro* is the product most often used, although *2-Nitro-2-methyl-1-propanol* and *2-Nitro-2-methyl-1, 3-propanediol* are also effective.

DISCOVER THE NITROPARAFFINS!

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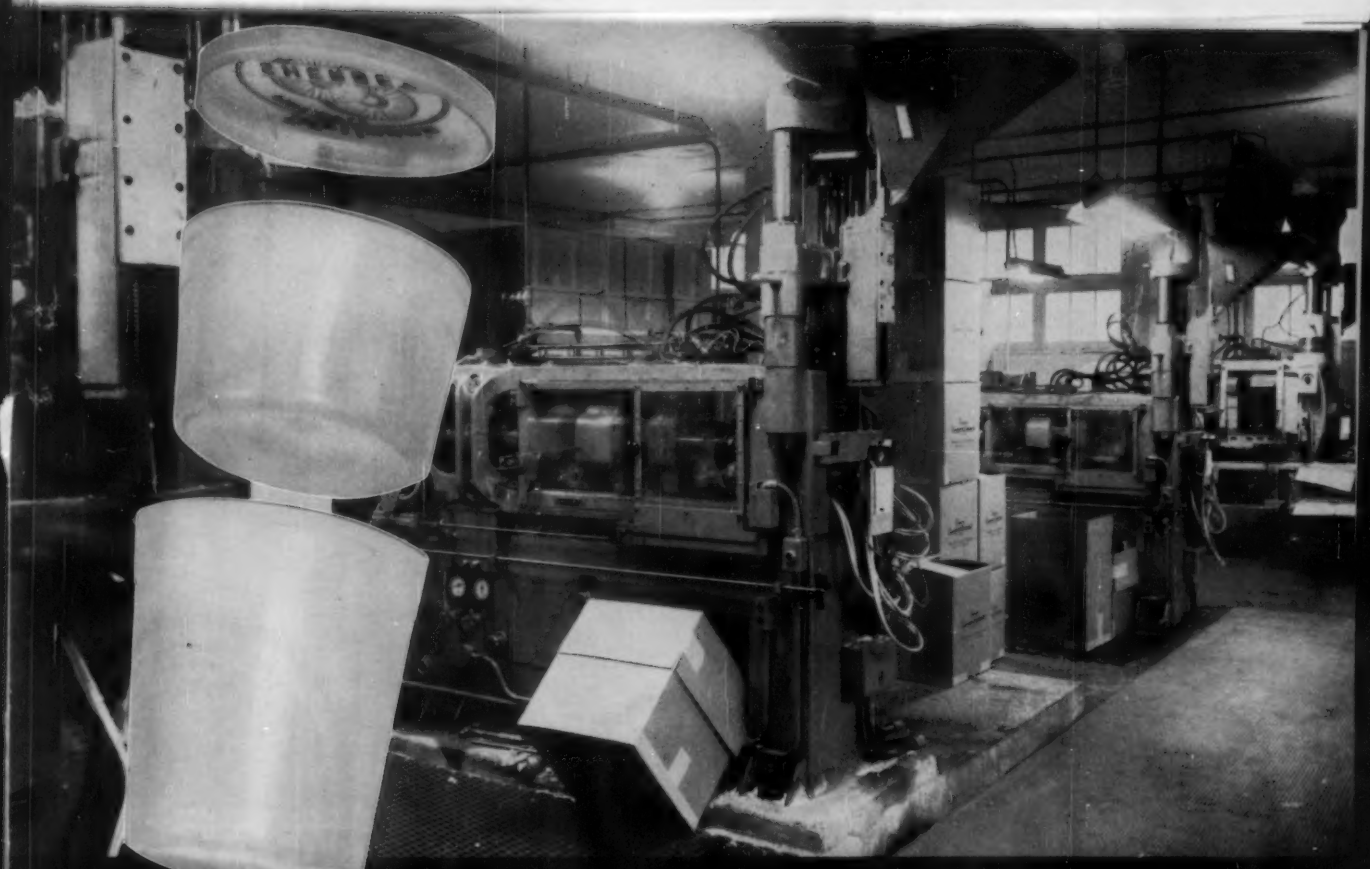
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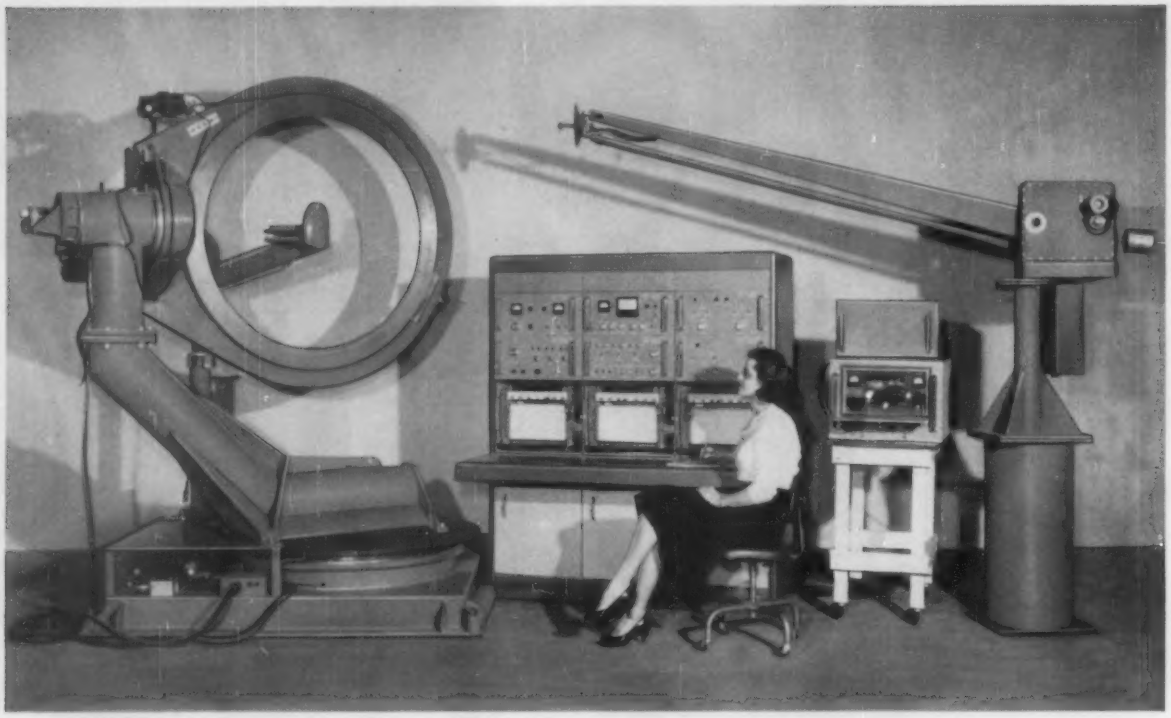
THIN-WALL CONTAINER BULLETIN No. 2

The figure noted above was current when this ad was prepared. By now it may be vastly improved. That is how fast the picture is changing at Davenport Containers, Ltd., Toronto, Canada.

Their new "Alternate C" 4 Oz. Lester is a 150 ton machine powered by 78 gallons per minute of pump capacity to give a plunger filling speed of 15.6 cu. in./sec.—935 cu. in./min. *Result: the overall cycle is just a few seconds more than the mold cooling time!*

Are you interested in the constantly changing picture of high-speed automatic molding? Write for complete specifications and illustrated literature on LESTER-AUTOMATIC Injection Molding Machines.

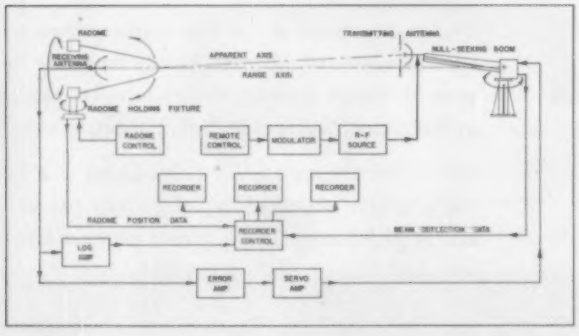
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TEST RADOMES AUTOMATICALLY

with the CTI Radome Boresight-Error Measuring System

The effectiveness of the best airborne radar tracking system can be completely destroyed by deflection of the radar beam as it passes through the plastic radome. Radome manufacturers and aircraft and engineering firms installing and testing radar equipment, faced with the tedious problem of measuring beam shift at various points on the radome, now have a fast and accurate method at their command. The CTI Radome Boresight-Error Measuring System automatically records beam deflection as a continuous function of the radome position, requires far less time than previous methods, and does not miss discontinuities often overlooked in point-by-point measurements.



RECORD BORESIGHT ERROR DIRECTLY WITH AN OVERALL SYSTEM ACCURACY OF ¼ MILLIRADIAN (1/70°)

As the motor-driven holding fixture rotates the radome under test, the servo-controlled, null-seeking antenna on the boom traces the position of the deflected radar beam. At the control console, under supervision of a single operator, three recorders plot the total magnitude and the horizontal and vertical components of the beam deflection angle directly in milliradians. Rate of change of the beam deflection, essential to missile applications, is readily obtainable from the recordings.

Additional features include automatic plotting of antenna patterns with or without the radome, and radome transmission efficiency measurements.

For additional information write to Dept. 11-6

Engineers: Career opportunities are currently available.

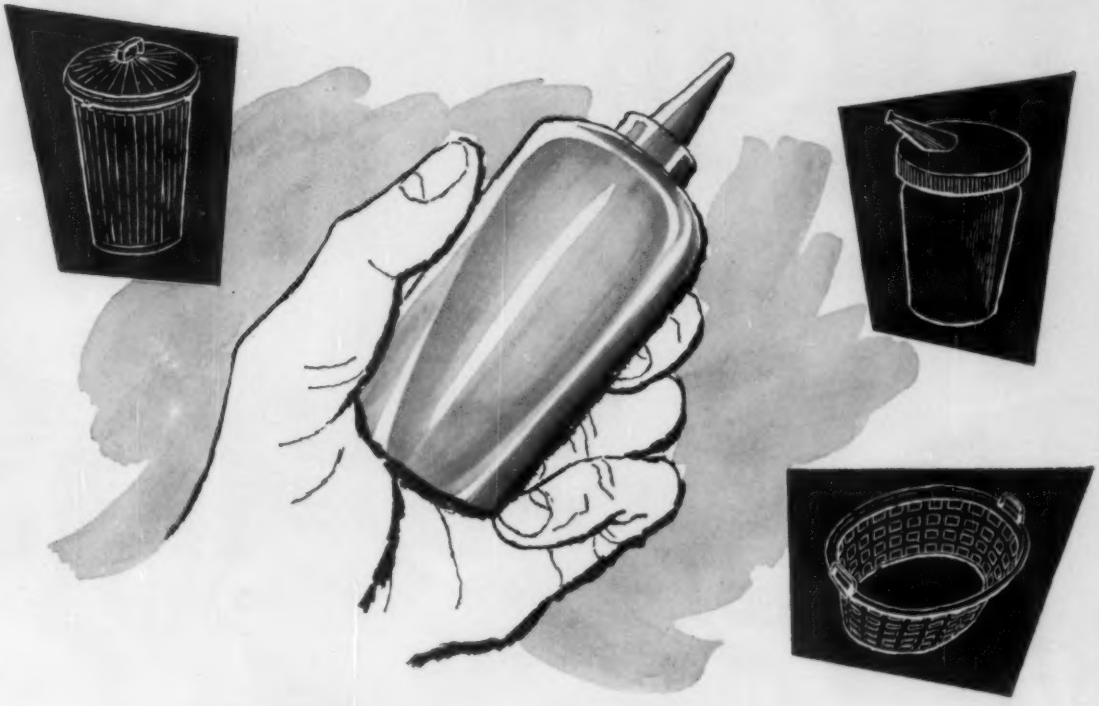
CALIFORNIA TECHNICAL INDUSTRIES
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PROMISE...

in a squeeze bottle



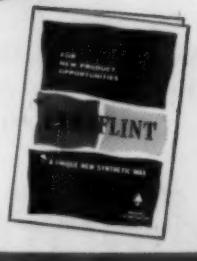
Recently completed tests of PARAFLINT blended with polyethylene in squeeze bottles demonstrate the versatility of this new low cost synthetic wax. The PARAFLINT blends have an improved melt index, mix readily, flow better, and have improved moisture vapor resistance. These promising tests indicate that finished products will be firmer, glossier . . . look and feel better without any loss of impact or tensile strength. Molders of high or low pressure polyethylene will profit three ways — lower raw material costs . . . lower production costs . . . competitively superior products.

Available in quantity
Uniform quality
15¢ lb.
Carload lots

PARAFLINT

THE NEW SYNTHETIC WONDER WAX

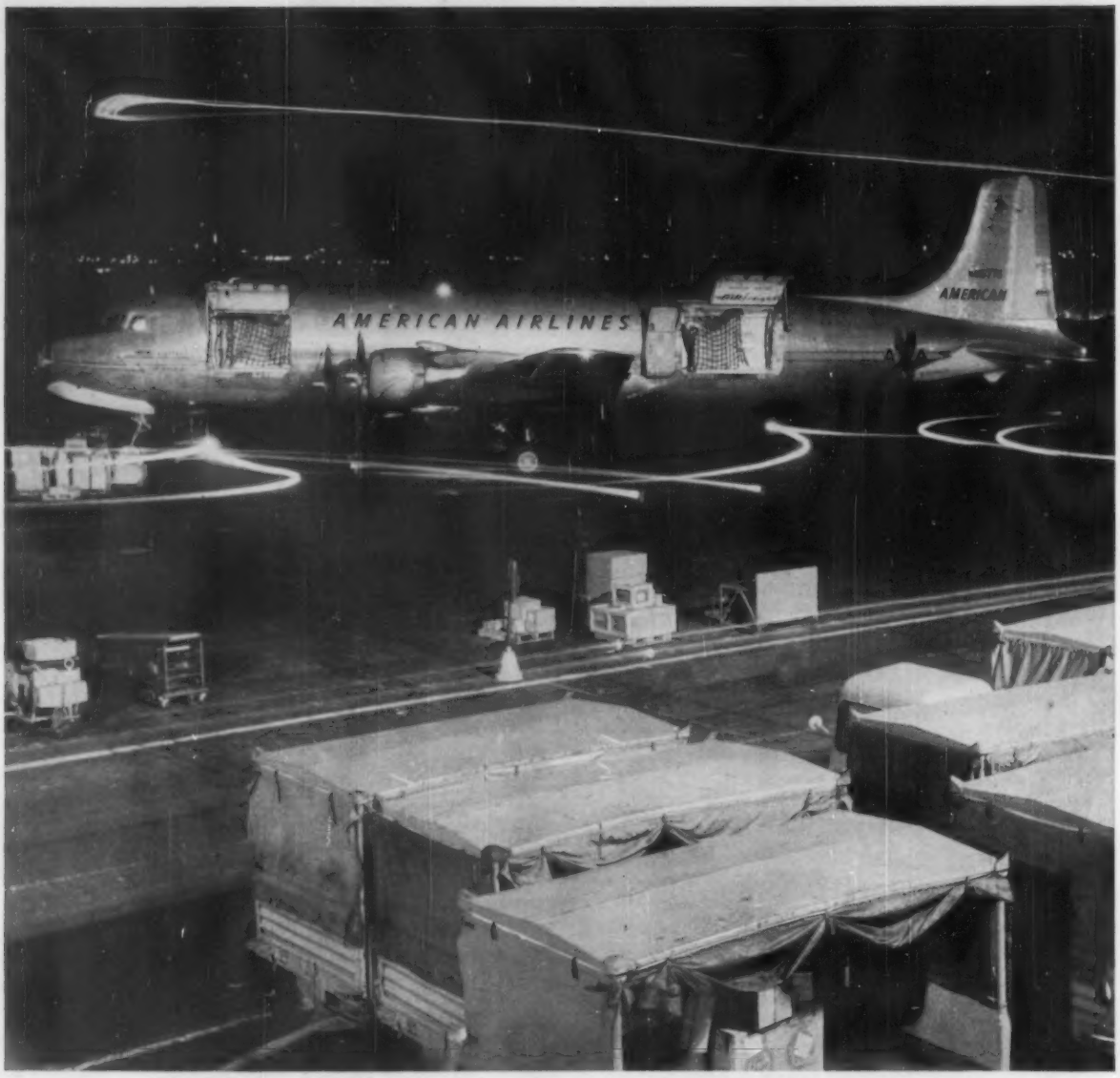
For specific performance data write on your company letterhead for results of the squeeze bottle tests and our PARAFLINT "Fact File".



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When it comes to top quality and important material savings, look to the leader in reprocessed plastics. Muehlstein is constantly improving technical standards and laboratory efficiency to help lower your production costs. Whether it's Polystyrene, Polyethylene, Vinyl, or any other thermoplastic, you'll find your profits growing bigger when you do business with Muehlstein.



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In sealing, potting and encapsulation—

EPON® RESINS

give excellent electrical, thermal and mechanical properties, plus—



Applying Epon resin sealing compound, formulated by Epoxylite Corporation, El Monte, California, to a 400-kva transformer winding at Larsen-Hogue Electric Co., Los Angeles, Calif.



Thoxene Clamp-Coat, an Epon resin cable splicing compound, produces a weatherproof, abrasion-resistant coating with high electrical insulation. Manufactured by Woodmont Products Inc., Huntingdon Valley, Pa.

- ✓ excellent dimensional stability
- ✓ high mechanical strength
- ✓ outstanding adhesion to metal, glass, plastics
- ✓ exceptional dielectric properties

Although relatively new, the Epon resins have won an important place in electronic and electrical manufacture. Their applications are manifold . . . in printed circuit laminates, transformer and motor sealing compounds, potting compounds for components and subassemblies, protective enamels, adhesives, tool and die materials.

For potting and encapsulating—the excellent dimensional stability of Epon resins, which can, for example, withstand solder bath temperatures without ill effect, and their outstanding adhesion to metals and glass assures airtight enclosure of delicate components and vacuum tubes.

As adhesives—solvent-free Epon resin formulations cure at room temperature with contact pressure alone; form powerful bonds between glass, metal, wood or plastic.

As sealing compounds—varnishes and enamels based on Epon resins provide excellent moisture sealing plus outstanding resistance to solvents and chemicals, even at elevated temperatures.

For laminating—Epon resins laid up with inert fibrous fillers produce base laminates that have superior dielectric properties and can be sheared, punched, drilled and bath soldered.

Write for information on the use of Epon resins in electrical and electronic applications.

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SHELL

The Plastiscope*

June 1957

News and interpretations of the news

By R. L. Van Boskirk

Section 1

Fifty percent carbon black for polyethylene. One of the most astonishing developments in polyethylene is the recent announcement by Godfrey L. Cabot, Inc., Boston, Mass., that it has developed a process for using 50% and more carbon black in polyethylene which "improves" the end product. Heretofore, the use of carbon black in polyethylene has been limited to 3% or less.

Called the CAB-XL process, it employs chemical methods and conventional plastics compounding equipment. The announcement states: "New compositions of matter are created in which finely-divided pigments and polymer are combined in an especially effective manner." Talk in the trade is that some sort of a cross-linking agent is employed.

Cabot asserts that this process will virtually overcome creep and fracture and that polyethylene compositions with 50% carbon black will remain flexible even at low temperatures. It also reports that polyethylene pipe made of this material shows resistance to stress cracking, improvement in high-temperature behavior, virtual elimination of plastic flow, and improved resistance to deterioration by solvents and oil. Burst strength is said to be doubled. Savings are obvious since carbon black costs about one sixth as much as polyethylene.

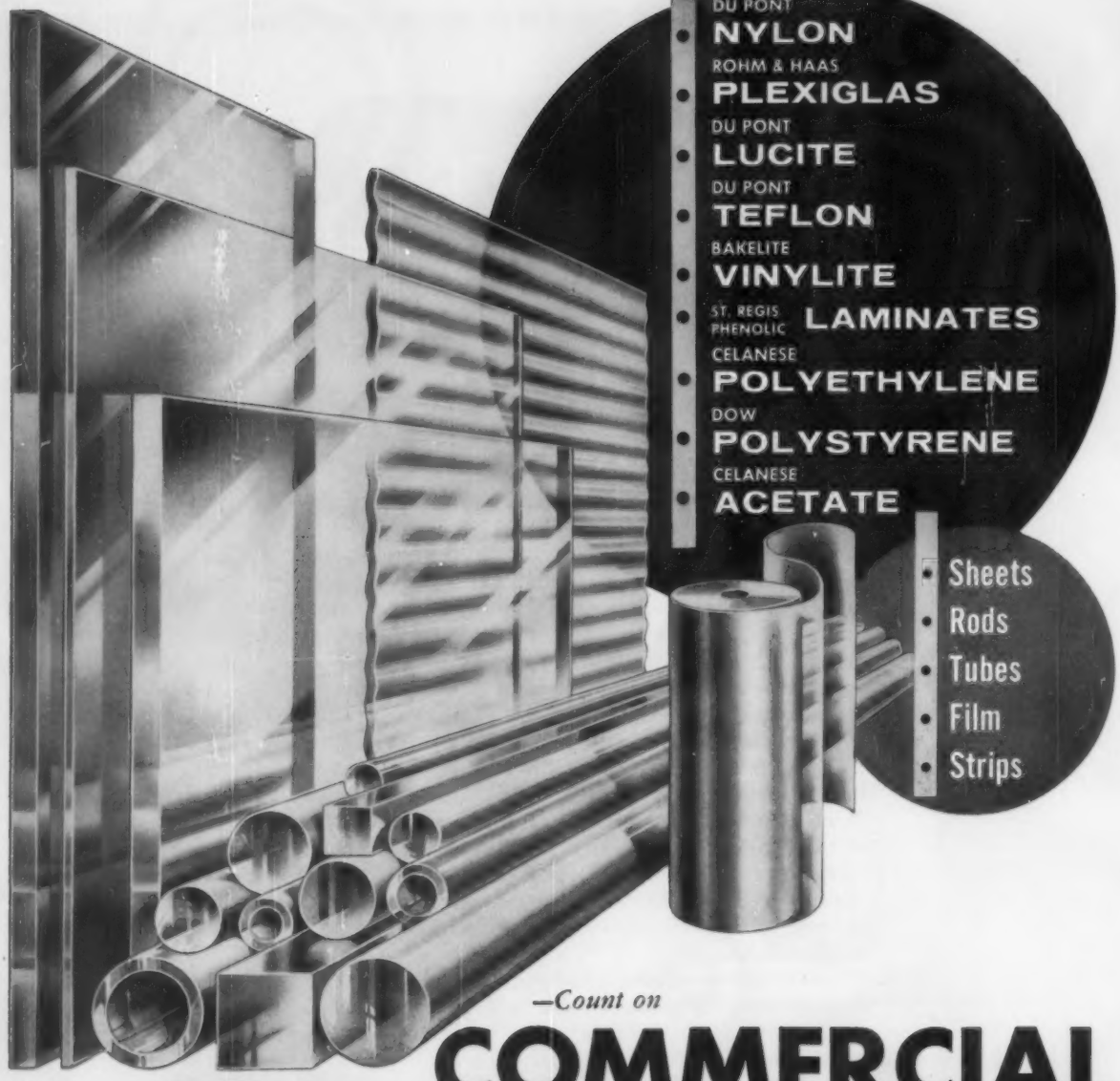
Cabot officials state that the process will be licensed—probably to both polyethylene producers and to large-volume users.

Low-pressure-processed polyethylene plant on stream. Commercial production of low-pressure-processed polyethylene has begun at the Semet-Solvay Div. of Allied Chemical & Dye Co. by a process reportedly unlike that of any other producer. Density, between 0.950 and 0.960, is comparable to other low-pressure polyethylenes; molecular weight is about 750,000. Plant capacity has not been revealed, although output is now reported to be at an annual rate of several million pounds.

At present only pipe grade is being made, and Orangeburg Mfg. Co., a pipe producer, will take most of the 1957 production. Special techniques have been devised to cope with the high melt viscosity of the material. Properties claimed include: no environmental stress cracking, high temperature resistance, good burst strength, extra smooth surfaces. Allied is currently at work developing formulations for molding, tubing, film, sheeting, and fibers.

More polyethylene from Spencer. Plans to double its high-pressure-processed polyethylene capacity at Orange, Texas, within a year have been announced by Spencer Chemical Co., bringing total volume for the company to 90 million

*Reg. U.S. Pat. Off.



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COMMERCIAL

—always a dependable source!

We're "stacked-up" to serve you . . Fast!

Apace with each day's increasing demands, we warehouse "in depth" and for immediate delivery, the industry's largest and most complete range of plastic materials . . . All types—sizes—thicknesses. All colors —and all formulations quality-certified for uniformity!

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Write Dept. MP for "Sq. Ft. Converter" Chart for sheets up to 67" x 102" —also New 1957 Catalog (64 pgs.) "Plastics for Industry"

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The Plastiscope

(*Continued from p. 37*)

pounds. The new facilities will be able to produce intermediate density as well as conventional polyethylene. The company also has a pilot plant in operation at Pittsburg, Kan., producing low-pressure-processed polyethylene under a Standard Oil (Indiana) license. Spencer estimates that consumption of conventional polyethylene will increase some 250 million lb. in the next four years. Consumption in 1956, including exports, was around 510 million pounds.

What is the last count on polyethylene capacity? The announcements on polyethylene capacity by Spencer and Allied Chemical add fuel to the polyethylene fire. Some 16 companies in the United States are identified as possible producers and 14 or 15 more plants are scheduled in foreign countries. Total estimated capacity for high-pressure-processed polyethylene in the United States by the end of 1957 or mid-1958 is more than 850 million pounds.

Estimates place low-pressure-processed polyethylene capacity at more than 350 million lb. by mid-1958. However, this does not include Kellogg, Brea Chemical, or Goodrich-Gulf, all of whose plans seem indefinite. Neither does it include Du Pont, Texas Eastman, Spencer, Monsanto, nor Dow, all of which have announced that they would be in the low-pressure field at some future date. In addition, the Aries process has reportedly been licensed to several potential producers, but there is no information on whether these licensees are already on the list of polyethylene producers.

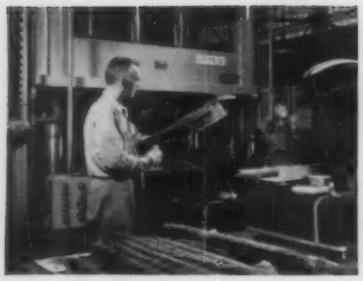
Forty-foot-wide polyethylene film. Polyethylene film 40-ft. wide and in 1½-, 3-, 4-, and 6-mil thicknesses is now being produced in 100-ft. rolls by Gering Products, Inc., Kenilworth, N. J. Believed to be the widest in production, the film is offered in either black or natural. It is used for building and highway construction, silos, tarpaulins, mulch, tobacco bed covers, and many other applications. Gering film is sold by the company's own sales group to distributors, who in turn sell the product to building supply houses.

Aspirin in polyethylene. Texas Plastics, Elsa, Texas, is reportedly selling ½ million polyethylene bags a month for packaging aspirin in three-tablet units. The film is 1¼ mil thick. The company has also supplied about 300,000 bags for experimental packaging of cauliflower. The cauliflower is stripped of its green leaves, cored, cut into six segments, and cooled in water. Weight is reduced thusly by about 50%, giving a 50% saving in freight charges. The bags, also made of 1¼-mil film, are 6 by 13 in. in size.

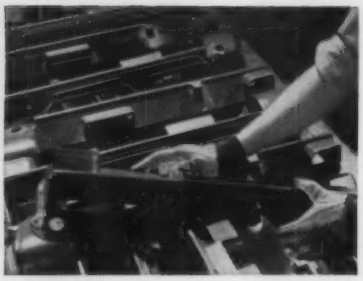
How to pressure-form the toughies. An unusual exhibit at the recent packaging show was Auto-Vac Co.'s display of pressure-formed snap-on lids and containers produced from plastics materials heretofore most difficult to form. Mylar, Mylar laminates, oriented polystyrene, high-density polyethylene, and nylon in thickness of from ½ to 187 mils have been formed on the company's new Pressure-Vac machine. Especially interesting was the forming of a 15-mil clear, unplasticized extruded vinyl section made from a Goodrich resin and a cast methacrylate engraving with extremely fine detail and intricate design;



1 This premix consists of reinforcing material, such as fiber glass or sisal, thoroughly mixed with polyester resin containing Dow Styrene.



2 The premix molding compound flows evenly to each and every section of the closed die as it is compressed under heat and pressure.



3 After a very short cycle, the finished premix molding is removed from the die. It is now ready for immediate assembly or shipment.



4 **CUTAWAY VIEW SHOWS** uniform strength in every section. There's no resin-rich area, no special reinforcing, no pre-forming.

For lower bids: premix moldings

For uniform strength: polyester resin with Dow Styrene

Many complicated parts—especially parts with varying wall thicknesses—are now made better, at lower cost, by premix molding. There are no resin-rich areas. Strength is uniformly distributed. Pre-forming is eliminated. And holes and nozzles can be molded in a part, eliminating punching and drilling operations.

Leaders of the automotive and appliance industries have proved the benefits of premix moldings for specific parts. Many innovations are now on the drawing boards.

The product shown is an example of the many now being made by premix molding using Dow Styrene. For technical assistance on Dow Styrene, write THE DOW CHEMICAL COMPANY, Midland, Michigan – Plastics Sales Department PL1886E.

Photographs through the courtesy of Fabricon Products, River Rouge, Michigan

YOU CAN DEPEND ON DOW

The Plastiscope

(*Continued from p. 39*)

the new $15,000 Pressure-Vac machine combines pressure and vacuum forming. Pressures used are up to 10 times vacuum pressure and timing cycles are 200 to 300% faster than conventional vacuum or drape forming methods, making possible the production of fine detail not heretofore obtainable by the forming process.

New variation of unmodified p.v.c. resin. A new variety of unmodified polyvinyl chloride resin that is distinguished for its very low viscosity characteristics has been announced by the Goodyear Chemical Div. of The Goodyear Tire & Rubber Co., Inc. Inherent viscosity of the new resin, Pliovic S50, is 0.68 compared to the conventional p.v.c. resins which range from 0.86 to 1.09. The new resin, which sells at 27¢ a lb.—the same price as standard p.v.c resins—is expected to enter into competition with 32¢ vinyl copolymer resins in some areas and also to broaden the base for unmodified vinyl chloride applications. Pliovic S50 exhibits the processing properties of vinyl copolymers while retaining the physical properties of unmodified resins and may be processed at temperatures 50° F. lower than that required of most straight p.v.c resins, according to Goodyear. (For more details see p. 298.)

Stabilizer sans fatty acids. Vinyl for film, sheeting, and extrusions, as well as for plastisols and organosols, can now be stabilized with a liquid barium cadmium compound, Thermolite 112, which, unlike conventional liquid Ba-Cd stabilizers, is free of all fatty acids and octoates.

Produced by Metal & Thermit Corp., Rahway, N. J., Thermolite 112 is said to give optical clarity, good heat and light stability, and superior heat-sealing and printability characteristics. Other advantages ascribed to the absence of fatty acids include: no pick-up of color or yellowing during calendering and extruding at high temperatures; pigmented vinyls with good initial color and no color drift during processing; no plate-out on calender rolls; better water resistance; and lower hazing.

Monsanto's new phenolic resin. A new general-purpose phenolic molding material called Resinox 1007, developed by Monsanto, is a two-stage, wood flour-filled compound intended primarily for cold-powder automatic molding but equally suitable for semi-automatic molding jobs. It has rapid flow, fast cure, and good mold and flash release. In semi-automatic molding, it is claimed to have unusually good preheating characteristics which result in reductions of cycle time. Primary significance of the new phenolic is that it will vastly speed up automatic press operation and other molding jobs where use of heated preforms is impractical.

Another producer of nylon rod. National Vulcanized Fibre Co., Wilmington, Del., is now offering extruded nylon rod or finished fabricated parts. Rod sizes range from ¼- through 2-in. diameter in 3- to 6-ft. lengths. National's fabricating facilities make nylon mechanical parts—bearings, gears, cams, rollers, spools, etc.—which are frequently used to replace brass when only one or a few parts



*TRADEMARK FOR W. R. GRACE & CO.'S POLYOLEFINS

W. R. GRACE & CO.
POLYMER CHEMICALS DIVISION
Clifton, N. J. Baton Rouge, La.

These men have 246 years of chemical and plastics experience. Their knowledge . . . distilled, job-tested, and schooled to perfection through the years . . . is now applied to a single task: getting better answers to plastics problems, with GREX, a *true* high-density polyethylene. These are the men whose purpose is to make your experience with GREX technically and financially rewarding, and your dealings with Polymer Chemicals Division equally pleasant.

The Plastiscope

(*Continued from p.* 41)

are needed. Nylon combines good mechanical and electrical properties with chemical resistance and is particularly notable for its low coefficient of friction and resistance to wear. The machined parts are suggested for textile, automotive, aircraft, electrical appliances, and business machines. There are now at least four companies in the United States providing this type of service.

Wedding of plastics and metal. From a world of invisible crystals so small that a billion of them occupy less space than a grain of table salt, a Detroit scientist, Dr. Michael W. Freeman, has produced substances which he claims will open an era of new materials.

Of all the materials tested, nylon plus iron offered the most promise, it is reported. The combination was developed, Dr. Freeman stated, for a leaf spring insert. A bearing of iron and nylon, produced by injection molding, withstood pressures in excess of those imposed on standard bushings.

Point-of-Purchase Institute Exhibit. Plastics has stolen the POPAI Show if the 1957 exhibition at Chicago is any criterion. There was nothing particularly new in plastics at the show, but there was every indication that plastics are taking over a bigger portion of the indoor and outdoor sign business every year.

Among the most prominent plastics items shown were deep compartmented impact styrene display trays with or without metallized treatment, miniature scenery for electric signs from butyrate sheet, acetate advertising sound records bonded to paperboard, 3-dimensional acetate signs for window stick-up, acetate flip charts that sometimes include six overlays, a white matte impact styrene sheet for the background of a metallized butyrate medallion, and a low-cost sound unit for a sign with Mylar tape as the principal gimmick since it can be used in thin enough sections to allow an hour's recording.

Growth in vinyl-coated fabrics. Shipments of vinyl-coated fabrics were 80% greater in 1956 than five years earlier, according to statistics furnished by the Vinyl Fabrics Institute and the Rubber Manufacturers Association. Total shipments in 1956 amounted to 83 million linear yards; 1956, the second best year in the industry's history, was about 10% below the 1955 record of 92 million yards. The Institute makes no attempt to estimate what proportion of industry-wide production these figures include, but it emphasizes that all firms in the industry are invited to participate in the program.

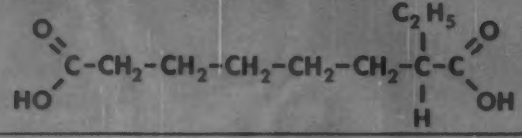
Bracon tubes on upswing. Bradley Container, a division of American Can Co., is now reported to be producing an average of 300,000 metal-end polyethylene tubes a day, or 6 million a month. Insecticides and detergents are among the major products going into this type container. Another multi-million use for collapsible polyethylene tubes is for foods, such as spreads, toppings, and mustard. The cost is about the same as a glass jar, with its accompanying label, lid, and cost of filling. Lined tubes are also beginning to take hold for greases since the liner in the tube prevents exudation of the grease.

U.S.I. ISOSEBACIC® ACID

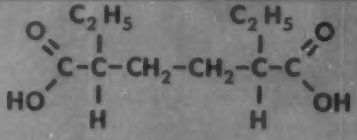
a new intermediate for vinyl plasticizers, polyurethanes, polyamides, polyesters, alkyds

a mixture of SEBACIC ACID ISOMERS

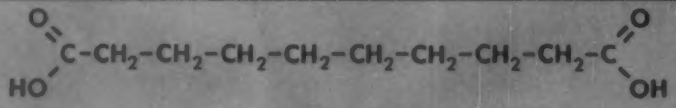
2- ethyl suberic acid — 72 to 80%



2,5- diethyl adipic acid — 12 to 18%



sebacic acid — 6 to 10%



U.S.I. ISOSEBACIC Acid lowers costs and improves performance when used as an intermediate for:

(1) vinyl plasticizers — gives excellent low-volatility, non-migration and low-temperature characteristics.

(2) polyurethane foams, (flexible and rigid).

(3) polyamide (nylon type) molding and extrusion plastics.

(4) polyester resins used in glass-reinforced plastics—gives improved flexibility.

(5) alkyd resins — imparts flexibility and water resistance to surface-coating film.

U.S.I. ISOSEBACIC Acid is a mixture of C_{10} dibasic acids which is now offered in pilot plant quantities at a development price of 45¢ a pound. Full-scale production prices will be even lower.

This new intermediate is a white crystalline solid with the following physical and chemical properties:

PHYSICAL PROPERTIES

Molecular weight	202.24
Combining weight	101.12
Density (80°C)	1.025 g/ml
	8.55#/gal
Melt viscosity (80°C)	78.5 centipoises
Specific heat of vapor (226°C)	0.34 cal/g (est.)
Heat of vaporization (226°C)	107 cal/g
Specific heat of solid (24°C)	0.33 cal/g
Heat of combustion	1296 K cal/mole
Flash point (closed cup)	430°F
Ionization constant at 25°C	$K_1 = 3.5 \times 10^{-5}$
	$K_2 = 5.1 \times 10^{-6}$

CHEMICAL PROPERTIES

1. Undergoes typical reactions of the dibasic acids.
2. Reacts with alcohols to yield both acid and neutral esters.
3. Reacts with basic materials to give acid and neutral salts.
4. Relatively stable material, not oxidized by air at ordinary temperatures.

Send for samples and a U.S.I. technical data sheet. Ask a U.S.I. technical representative to call.

U.S.I. INDUSTRIAL CHEMICALS CO.

99 Park Avenue, New York 16, N. Y.
Branches in principal cities
Division of National Distillers and Chemical Corp.

TECHNICAL BULLETIN

CLAREMONT RESEARCH DIVISION

date: JUNE 1, 1957

subject:

NEW!

THE VC—4200 SERIES

TARNISH RESISTANT BRONZE GOLD INKS FOR PRINTING VINYL

True *Metallic* lustre
and greening resistant, too.

Claremont vinyl inks are distinguished by dependable, uniform working qualities. They give top quality results with conventional equipment and thinners. Stock formulations for valley, gravure and laminable printing. If your requirements are special, we can develop formulations to meet your needs. Ask for our Technical Bulletins Nos. 340 and 348. Data is ready also on our ink service for polyethylene printing.



PRINTS BY HARTFORD TEXTILE CORP.

CALIBRATED VINYL COLOR DISPERSIONS

For Calendering—Plastisol—Extrusion

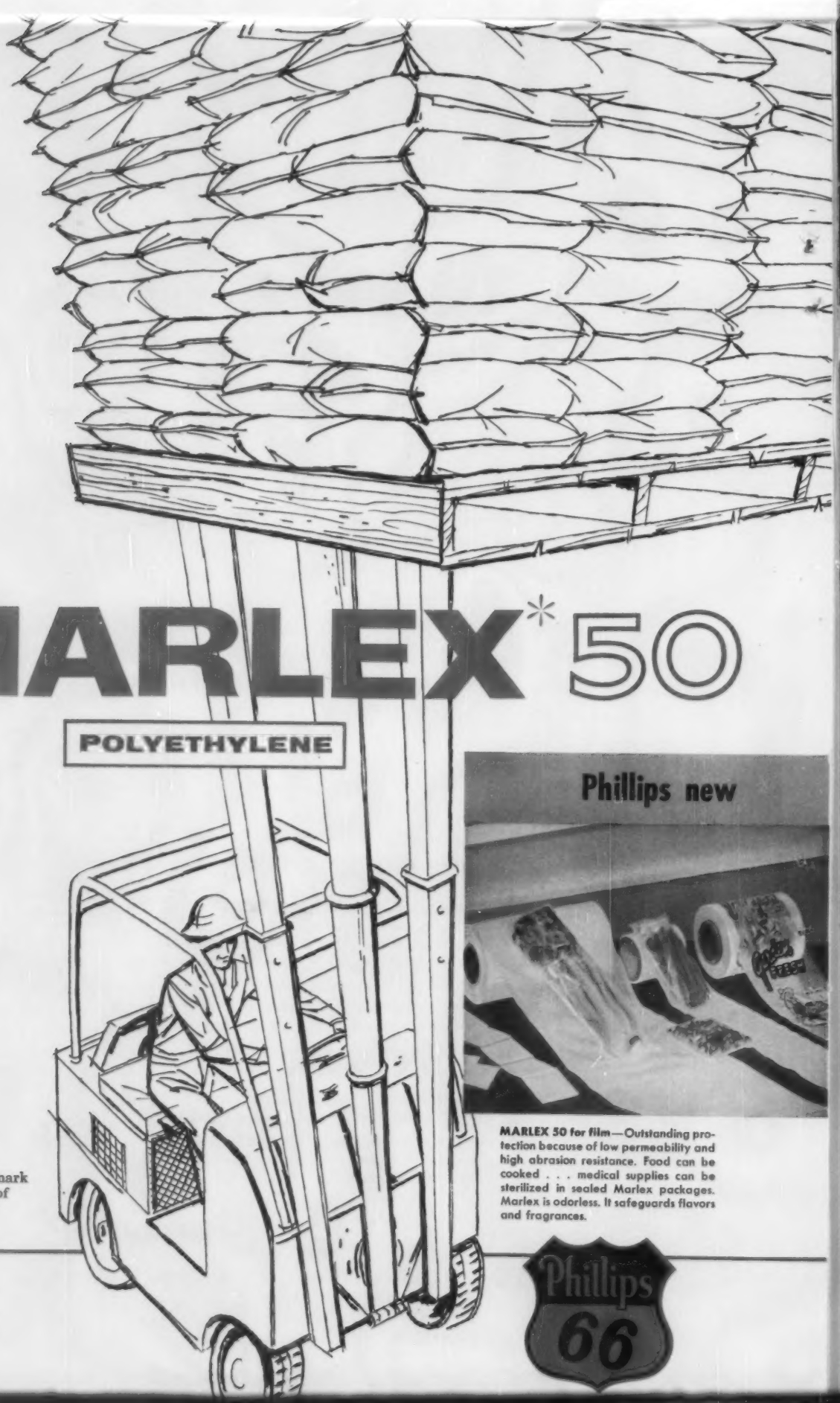
Claremont's system of color calibration, a proven production time saver, enables vinyl calenderers to run as many as eighteen different colors per day without down time. Color range of Claremont dispersions is spectrum wide, includes non-tarnishing metallics also. The data in our Technical Bulletins Nos. 175 and 140 are practical and valuable to vinyl fabricators. Ask for your free copy.

Remember that the formulation of plastic colorants and plastic printing materials—calibration and maintenance of color uniformity—are continuously applied sciences at Claremont.

Claremont is an information and service center on plastic coloring and printing problems.

Our engineering suggestion and advice are always yours for the asking.

CLAREMONT *pigment dispersion corp.* ■ *39 powerhouse road, roslyn heights, l. i.*



MARLEX* 50

POLYETHYLENE

MARLEX 50 for film—Outstanding protection because of low permeability and high abrasion resistance. Food can be cooked . . . medical supplies can be sterilized in sealed Marlex packages. Marlex is odorless. It safeguards flavors and fragrances.

* MARLEX is a trademark for Phillips family of olefin polymers.

Phillips 66

MARLEX* 50 NOW

"ON STREAM" IN COMMERCIAL QUANTITIES

● THE LONG-AWAITED, revolutionary plastic, Marlex 50 is now available. It is a *new kind* of material, one of the most important developments in the plastic industry since polyethylene was introduced in 1939.

Your sales can now be increased with new and better products made from Marlex 50. Its greater resistance to heat and chemical attack, lower permeability, greater rigidity and other unusual properties offer a whole new field of profitable applications!

Manufacturing economies are yours through the greater strength and rigidity of Marlex 50 and its ability to set up at higher temperatures. Up to 40% more items per pound of resin . . . up to 25% faster cycle time in moldings. Yes, here's a *new kind* of plastic to help you produce better products more profitably. Today, call your local Marlex sales representative and find out more about how Marlex can make money for you.

NEW SALES SERVICE LABORATORY

Phillips experienced technical service staff will assist you in working out new products and processes utilizing Marlex. Make arrangements with your local Marlex sales representative.

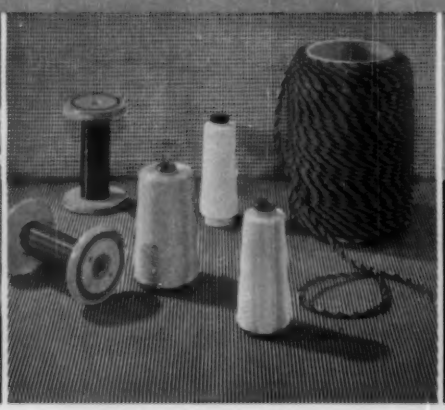


is Moving to All America

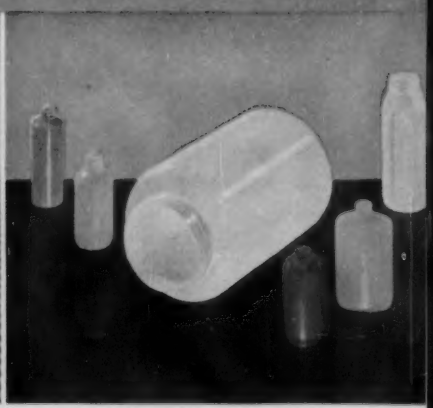
rigid polyethylene offers processors new market opportunities



MARLEX 50 for injection molding—Rich colors, glossy surfaces, fine details! Marlex 50 moldings withstand up to 250°F without losing shape . . . endure temperatures far below zero without losing toughness and pliability. Ideal for accurate vacuum moldings.



MARLEX 50 for fabrics—Easily processed into fabrics and rope with high tenacity and low elongation. Exceptional oil and chemical resistance. Withstands boiling soapy water, dry cleaning solvents, and prolonged exposure to sun and weather.



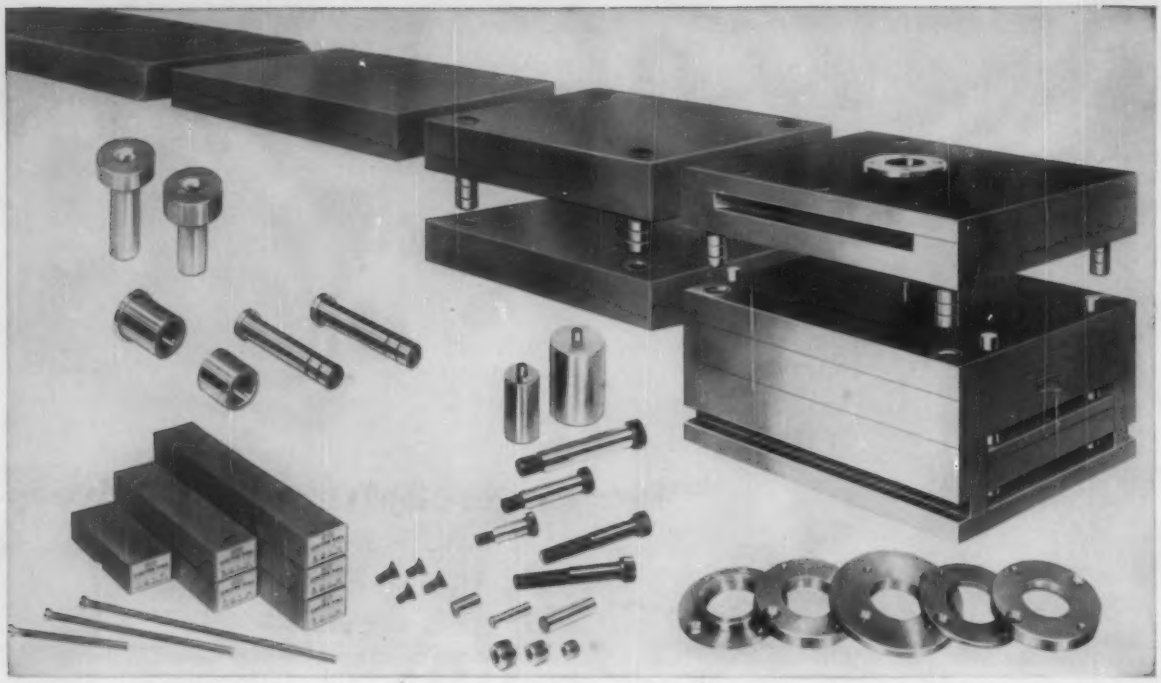
MARLEX 50 for blow molding—Rigid, tough, pure! Conforms intimately to mold surfaces. Remarkable resistance to chemicals and heat. Can be sterilized repeatedly. Excellent for bottling foods, drugs, chemicals, oils. Use Marlex 50 for caps and closures, too.

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PROGRESS THROUGH STANDARDS

. . . and how DME "helped"

The history of economy in modern business has been directly related to the history of Standardization. One of the major elements affecting the economic production of finished plastic parts is the high initial cost of the mold. A progressive step in reducing mold cost, without sacrificing the high quality required, has been successfully achieved through Standardization.

When D-M-E originated Standard Mold Bases and their component parts in 1942, it provided the answer to the rapidly growing demand for high quality molds that would maintain and promote the economic advantages of plastic parts.

Through large volume purchases of quality steel in standard sizes and specialized production facilities, D-M-E was able to produce and supply high quality Standard Mold Bases to mold makers and molders at such great savings in cost and time that the benefits of Standardization were quickly realized by the Industry.

Today D-M-E produces twenty-two different sizes of Standard Mold Bases, from 9″ x 8″ to 18″ x 35½″, in either D-M-E No. 1 or No. 2 Steel, with a wide range of cavity plate thicknesses to satisfy the diversified demands required. In addition, over 2,000 finished component parts of the same high quality are available to provide additional savings in service as well as in the product.

Properly engineered Standardization puts the accent on Economy. When you "Specify D-M-E . . ." you get Quality, Service AND Economy!

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for
QUALITY . . .
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ECONOMY!



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PLANT ENGINEERS CUT LABOR TIME 75%

WITH NEW CORROSION-FREE DRAINAGE SYSTEM



Industry develops new easy-to-install low cost drainage pipes and fittings of PVC based on EXON 402-A

...another use typical of the Pin-Pointed Properties in Exon Vinyl resins

Tube Turn Plastics, Inc., timed a journeyman plumber as he made a bell and spigot joint in a 2" Schedule 40 alloy cast iron line. *It took 3 minutes, 45 seconds.*

Then he joined a length of new 2" Schedule 40 PVC pipe to a newly developed PVC socket type solvent welding drainage fitting. *Complete time: 56 seconds . . . a labor saving of 75%.*

This is one reason it is more economical to dispose of corrosive industrial liquid wastes with drainage systems of PVC based on Exon 402-A resin. Installation requires less labor per joint . . . fewer tools and materials . . . and fewer joints.

The new socket type drainage fitting eliminates troublesome corrosion pockets and gives you unimpeded flow conditions. It is unaffected by ground conditions, acid or alkaline, wet or dry. It is not subject to galvanic or electrolytic action.

Exon 402-A is just one resin in industry's most complete line of versatile vinyls. No wonder industry looks to Firestone for engineered answers to its needs.

For resin properties pin-pointed to the best answer to your own plant or product problems, check with Firestone.

Firestone

EXON

RESINS

For complete information and technical service, call or write:

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DEPT. 72H, POTTSTOWN, PA. • A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

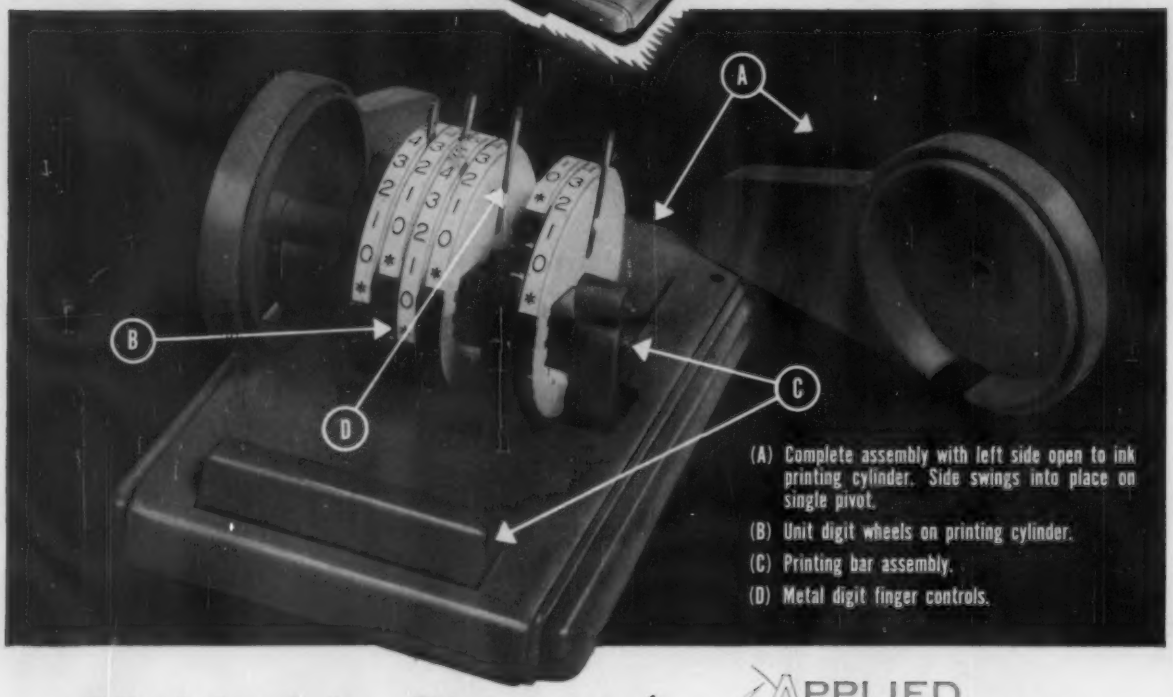
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INDUSTRY'S MOST COMPLETE LINE OF VINYLS ENGINEERED TO YOUR SPECIFIC NEEDS

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This handy check writer had to be inexpensive, lightweight, sturdy and absolutely reliable. Its cost must be low to give small retailers, professional men and even householders check protection. Quinn-Berry engineers were chosen for this job.

Here you see illustrated the many molded styrene parts and their function in the complete assembly. Precision engineering backed up by dimensionally stable thermo-plastic molding proved to be the desired answer.

Again a Quinn-Berry achievement in an unusual molded plastic application . . . proving, of course, that at Quinn-Berry the "Unusual is Routine."



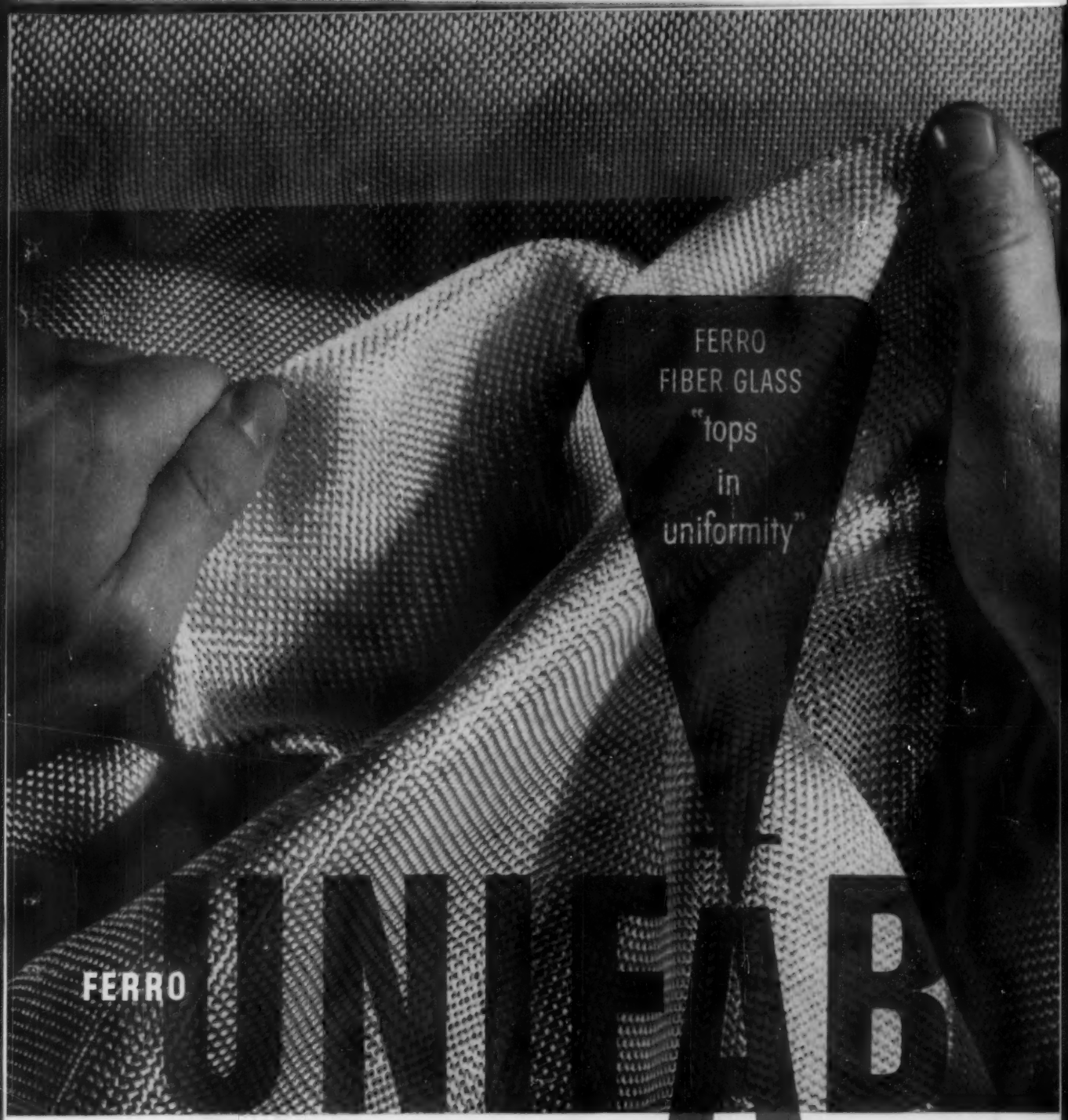
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CUSTOM MOLDERS OF ALL TYPES OF THERMOPLASTICS



A new reinforcing fabric for plastics

Newest member of the Ferro family of Fiber Glass products, UNIFAB provides the ultimate in plastic reinforcement. Made to high quality standards and checked at every stage of production, you'll find UNIFAB fabrics unusually uniform in weight, thickness and weave Write for samples, specifications and prices.

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Mylar adhesives have to be as versatile as the famous polyester film itself. Bond strength, clarity, resistance to light, even flow for machineability, affinity for a variety of surfaces . . . all are features needing careful control.

At Angier Adhesives, hundreds of laboratory and test hours have been focused on Mylar adhesives alone. There is an Angier adhesive for laminating Mylar to itself or to most other materials . . . to sheet metal as a lining . . . to aluminum foil as a vapor barrier . . . to leather as a surface protective . . . to vinyl film for decorative purposes . . . to asbestos paper for wire insulation, etc.

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For EVERY Industry: Latest developments in adhesives for Sandwich Panel Construction, Vinyl Film Bonding, also Rubber, Latex and Resin Cements, Pressure Sensitive Cements, Flocking Cements, Laminants, Sealants, Tie Coats and Resin Emulsions.

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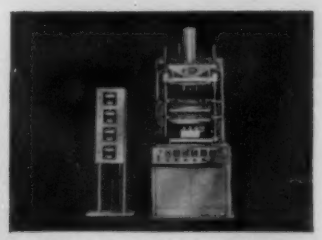
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Reduces machine investment, tooling costs, by more than 50%





VAC-TRIM combines straight vacuum, drape and plug forming—plus automatic trimming—in a single machine. Saves equipment costs, labor, floor space. Push-button operation. Complete flow-control system.



VacForm 88FM is a compact, versatile machine arranged for both drape and straight vacuum forming. Maximum mold size, 16½" x 16½". Manual and semi-automatic controls.



VacForm "GIANT" is world's largest vacuum forming unit. This model, engineered and built to National Broadcasting Company specifications, has a forming area 12' long and 6' wide, is used for low cost three-dimensional TV scenic elements. Comparable models built to special order for a wide range of special applications.

VacForm equipment costs substantially less than comparable plastic molding equipment, both in terms of original investment and tooling costs.

It can also give you increased production, lower costs and a broader range of end products. VacForm uses inexpensive molds... reduces retooling "down time" to a minimum... works with more types of plastics... requires minimum maintenance.

VACFORM

PLASTIC FORMING MACHINERY

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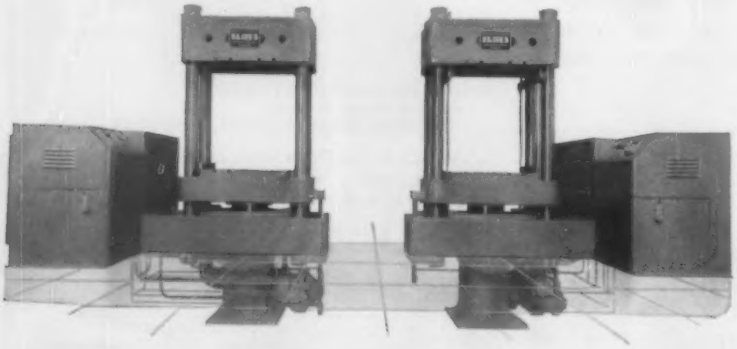


"Job-Fitted" HYDRAULIC PRESS

Is a "troublesome shape" getting you in a squeeze? Tough production problems involving unusual shapes are often "old hat" to Elmes engineers—situations made to order for Elmes ingenuity in helping with consultation and recommendations.

Sometimes a standard design Elmes® Press, or a simple adaptation of it, will handle the customer's requirements. Sometimes the work to be performed involves development of a special custom-built press. But, *whatever it takes,* Elmes is equipped to provide *the right press for the job!*

It just makes sense to take advantage of the best of someone else's experience—particularly when it is backed up by more than 60 years of leadership in specialized hydraulic service. Whatever your pressing problem, it will pay you to call in Elmes. See your nearby authorized Elmes distributor, or write to us direct.



Compact installation of Elmes 300-ton Compression Molding Presses with controls and top knockouts arranged so that one operator can handle both presses. Elmes standard and special designs include presses for compression or transfer molding operations, hot-plate laminating, or reinforced plastics molding.

American Steel Foundries

Elmes

ENGINEERING DIVISION

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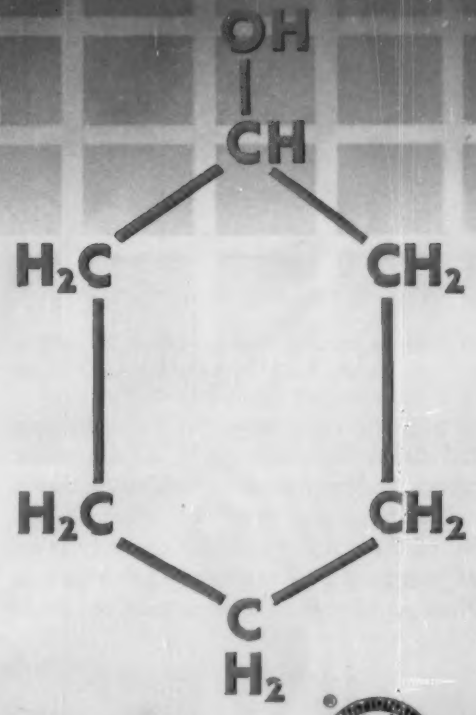
• METAL-WORKING PRESSES • ACCUMULATORS
• PUMPS • PLASTICS MOLDING PRESSES

Now on Stream...

substantial new basic production of Cyclohexanol at Hopewell, Va.

under the brand name

National **NAXOL*** (CYCLOHEXANOL)



Here are the quick facts about a new major source of this important secondary alcohol:

National NAXOL is made in a modern streamlined plant by a highly-efficient direct catalytic process.

Our production is completely integrated right back to the basic raw materials within the Allied Chemical group.

Our output is substantial, completely competitive in every respect and can be quickly expanded to meet any foreseeable demand.

Two types immediately available: NAXOL (100% material) and NAXOL D (protected against freezing).

We invite inquiries from present and prospective users of either grade and will be pleased to send working samples, price quotations and delivery on C/L and LCL quantities.

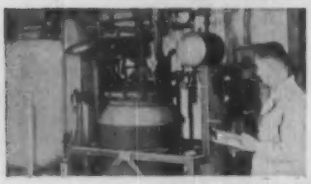
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go straight

to the polyester resin specialists!

Take your polyester resin needs straight to the one source that makes them *exclusively*. As America's largest producer of government specified synthetic resins, our entire plant is devoted to research and production of these materials. Our capacity is as flexible as your needs. We can handle 1,000 pounds or 30 million pounds with the same ease, the same individual care, the same follow-thru. Concentrating on one job makes possible a custom kind of service that has paid off in an impressive list of American Alkyd customers. They appreciate the extra *service*, the extra *assistance*, the extra *quality* and the shortage of red tape! Send for *free* "Fact File" on polyester resins.

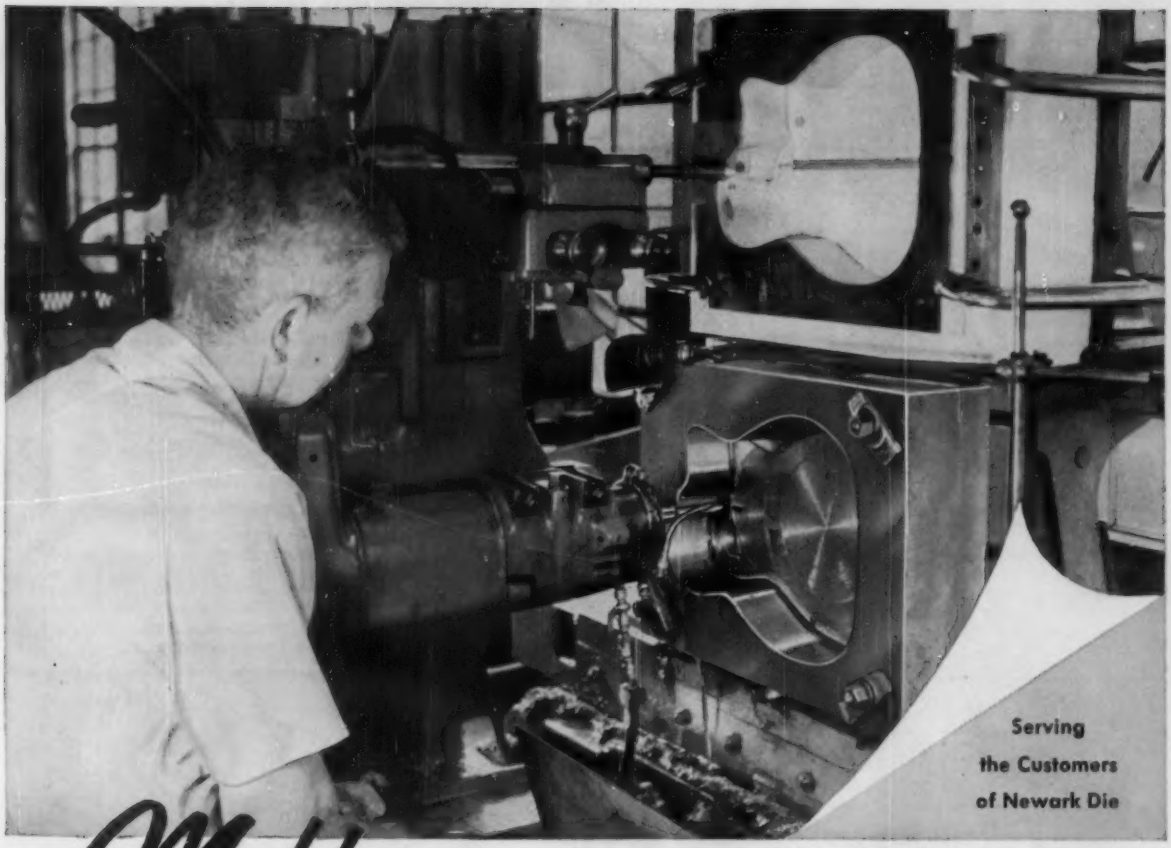


Manufacturers of Synthetic Resins . . . Reactive, General Purpose, Light Stabilized, Thexotropic, Flexible, Fire Retardant, Gel Coat.

For complete information, call the President

AMERICAN ALKYD INDUSTRIES

Broad and 14th Streets, Carlstadt, N. J. • Geneva 8-4332



Molds ACCURATELY DUPLICATED FROM MASTER PATTERNS ON DIE SINKING MACHINES

In Keller machines like the one shown—one of a battery in use at Newark Die—a tracer passing over a master pattern automatically controls the movements of the feeding mechanism, which in turn governs the cutting of the mold.

Because of the delicacy of this electrical control when used by the skilled craftsmen at Newark Die, the finest of work can be done on the largest of molds.

Keller die sinking machines are typical of the many types of up-to-the-minute equipment now turning out molds to serve the customers of Newark Die.

"Write for articles on solving big mold problems and new Revolutionary Type injection molding machines"

NEWARK DIE COMPANY

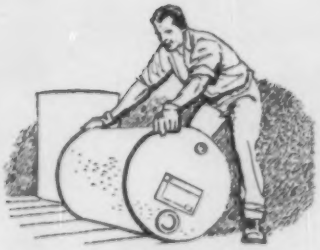
22 SCOTT STREET, NEWARK 2, N. J.

Phone: MArket 2-3305

NDC TRADE MARK

ANNOUNCING HETRON® 33

Get top-quality moldings at lower cost with this new Durez polyester



1. You'll be pleased, we think, with this new HETRON medium-viscosity semi-rigid polyester. It's just out of the lab and in *limited* commercial production. Its name is HETRON 33.

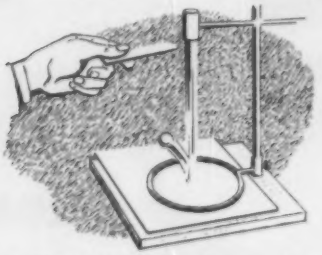


2. You can get outstandingly strong, crack-resistant laminates with HETRON 33. It's formulated especially to give you high-quality matched-die moldings. And you get them at *new low cost.*

Flexural Strength, 73°F, psi	40,900
Flexural Modulus, 73°F, psi	1.6×10^6
Flexural Modulus, 180°F, psi	1.0×10^6
Tensile Strength, 73°F, psi	21,500
Tensile Modulus, 73°F, psi	1.7×10^6

TESTS MADE on 1/10" laminates containing 40% glass, 15% filler, 45% HETRON 33.

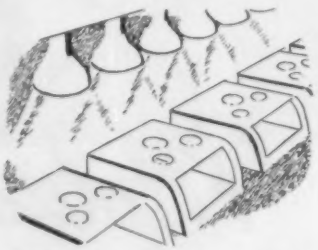
3. Imagine a semi-rigid resin with physicals like these for this type of laminate! HETRON 33 actually combines *resiliency* of a semi-rigid with *strength* of a rigid resin. And it gives you parts that *don't crack or craze.*



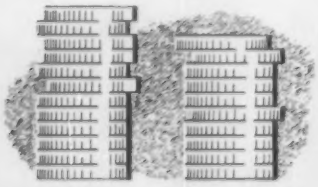
4. High reverse impact is another reason why you'll find HETRON 33 just right for parts that must stand up under rough usage. It minimizes rejects; cuts hand finishing up to 50%.



5. Wet strength is outstanding, too. Typical laminates retain 91% of flexural strength and flexural modulus after a 2-hour water boil. Water absorption after a 2-hour boil is only 0.1%.



6. Baked-on finish can be applied with excellent results to parts made with HETRON 33. Typical laminates can be baked at 350°F for 90 minutes, *several times,* without cracking or crazing.



HETRON 32A HETRON 33

7. Makes you more competitive on top-quality moldings. Because of research improvements, HETRON 33 gives you these properties *for less money!* Lower cost per pound, combined with lower gravity, saves you about 13%!

8. See for yourself how you can get superior moldings with HETRON 33—within a price range you and your customers can't afford to pass up! *Try this new resin on the toughest matched die molding job now on your presses.* For a sample and technical data, just cut out this coupon, attach to your business letterhead, and mail today.

HETRON 33 has permanent, built-in flame resistance, too—but to a somewhat lesser degree than other HETRON resins.

DUREZ® *Plastics that fit the job*

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

3006 Walck Road, North Tonawanda, N. Y.

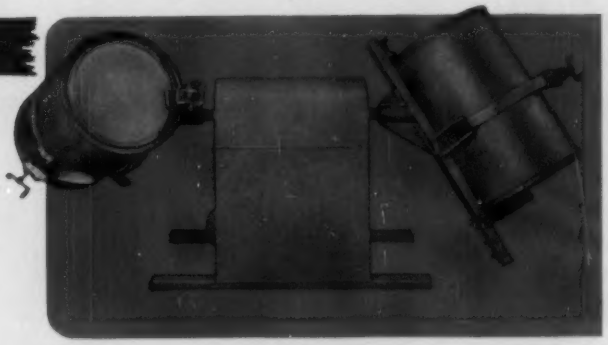
HOOKER CHEMICALS PLASTICS

CUT MIXING COSTS! STEP UP PRODUCTION!

with

"U.S." Drum Handling Equipment

FIBRE DRUM TUMBLERS



For fastest, most efficient dry color mixing in your own or suppliers' fibre drums. Saves cleaning and handling time. Loads and unloads quickly, blends thoroughly. Economically priced, sturdily built and readily adjustable to any size fibre drum. Two-drum capacity; handles loads up to 500 lbs. per drum. Standard equipment includes ¾ h.p. motor; higher h.p. motors available.

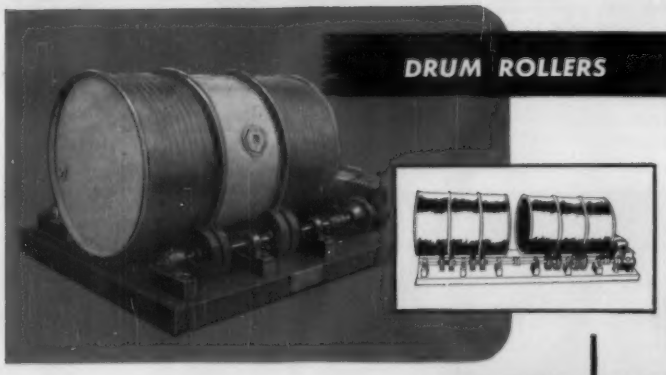
HEAVY DUTY DRUM TUMBLERS



These units provide quick, effective, economical mixing and blending of dry colors with plastic molding compounds. Made in two sizes to handle either one or two standard 55-gallon drums. Ruggedly built for long life and smoothest tumbling action. Handles loads up to 1000 lbs. per drum. Yoke opens quickly and easily, locks securely. Heavy duty 1 h.p. motor; constant or variable speed drive.

Units for 10- or 30-gallon drums also available.

DRUM ROLLERS



Easy, time-saving mixing of powders or solutions—right in their shipping drums. "U. S." adjustable Drum Rollers handle any round container from 5-gallon pail to 55-gallon drum. Sturdy rubber wheels can be positioned to clear hoops and bung openings. Made in 1, 2, 3, or 4 drum capacities, with constant or variable speed drive. Loads up to 750 lbs. per drum handled easily. Special mixing containers also available.

Write for Bulletin 280

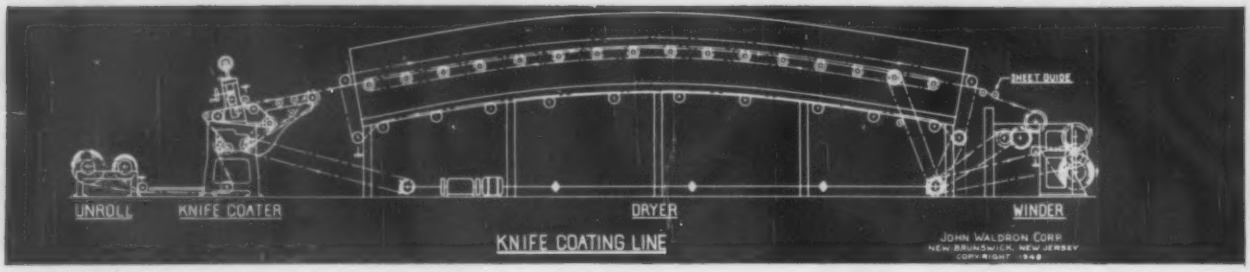
PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

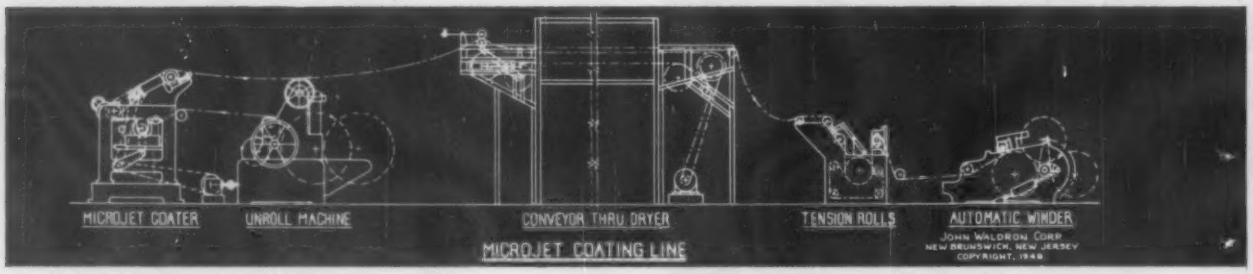
AKRON 9, OHIO

WALDRON

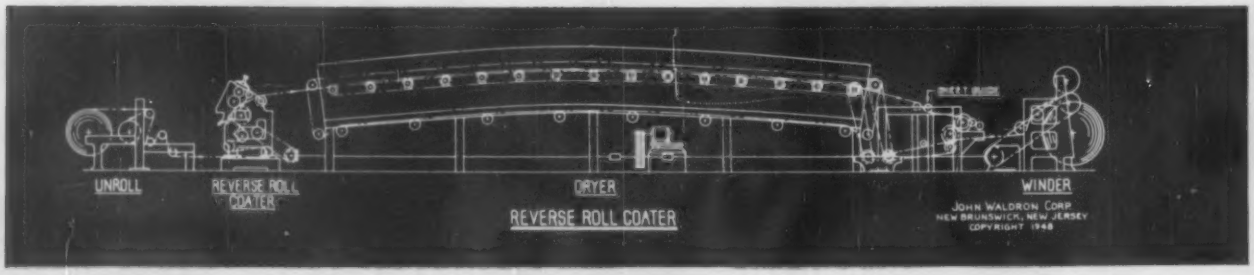
...in Plastics



from the Industry's

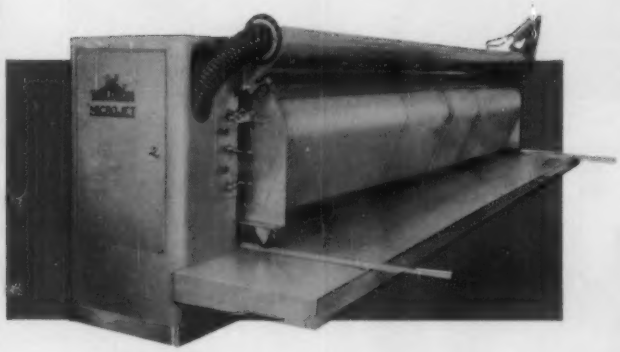


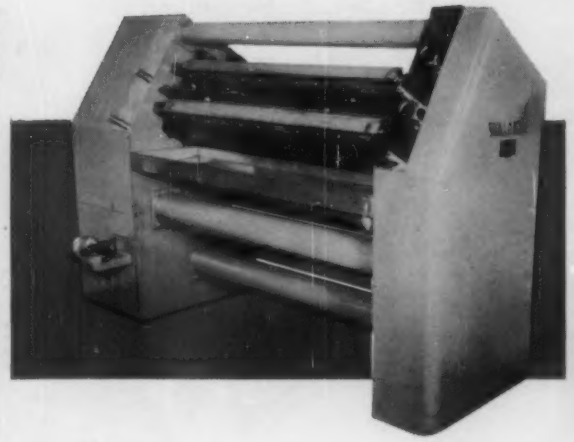
Pioneering Days...



...130 Years in Web Processing Generally







★ Formations of Plastic Films
★ Decoration of Plastic Films
★ Slitting and Winding
★ Laminating

The John Waldron Corporation has been in continuous business now for 130 years. This in itself might be of only passing interest but for the fact that web processing has always been our business. Even in the earliest days, our business sign could have read . . . 'Designing and Manufacturing Machines for Processing Webs, Sheets or Ribbons'.

Paper came first, followed by rubber and when other plastics began to come into the market, Waldron design engineers were right in the center of things. As the plastics industry expanded—both in kind of plastics and in uses—it was generally a Waldron machine that took care of the web processing steps involved.

Today, the scope of Waldron design and manufacturing service in connection with the processing of plastic webs is as broad as the plastics industry itself. But it is significant that in our whole experience, we have seldom made two machines exactly alike, except for repeat orders. That's the peculiarity of web processing. Rarely are two problems alike, thus precluding the manufacture of so-called 'stock designs'.

Waldron Engineers are fully experienced in all web processing problems. If you have any machine requirement coming up in the near future, why not discuss your problem first with a Waldron engineer? He might be able to contribute something very helpful to your planning.



As a preliminary step to a discussion, send for our general catalog (No. 125) on WALDRON Plastic Processing Machinery.

THE ROSS GROUP
OF COMPLEMENTING SERVICES

J. O. Ross Engineering Corporation, New York
Andrews and Goodrich Division, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton Corporation, Dayton
Carrier Ross Engineering Company, Ltd., England
John Waldron Corporation, New Brunswick, N. J.

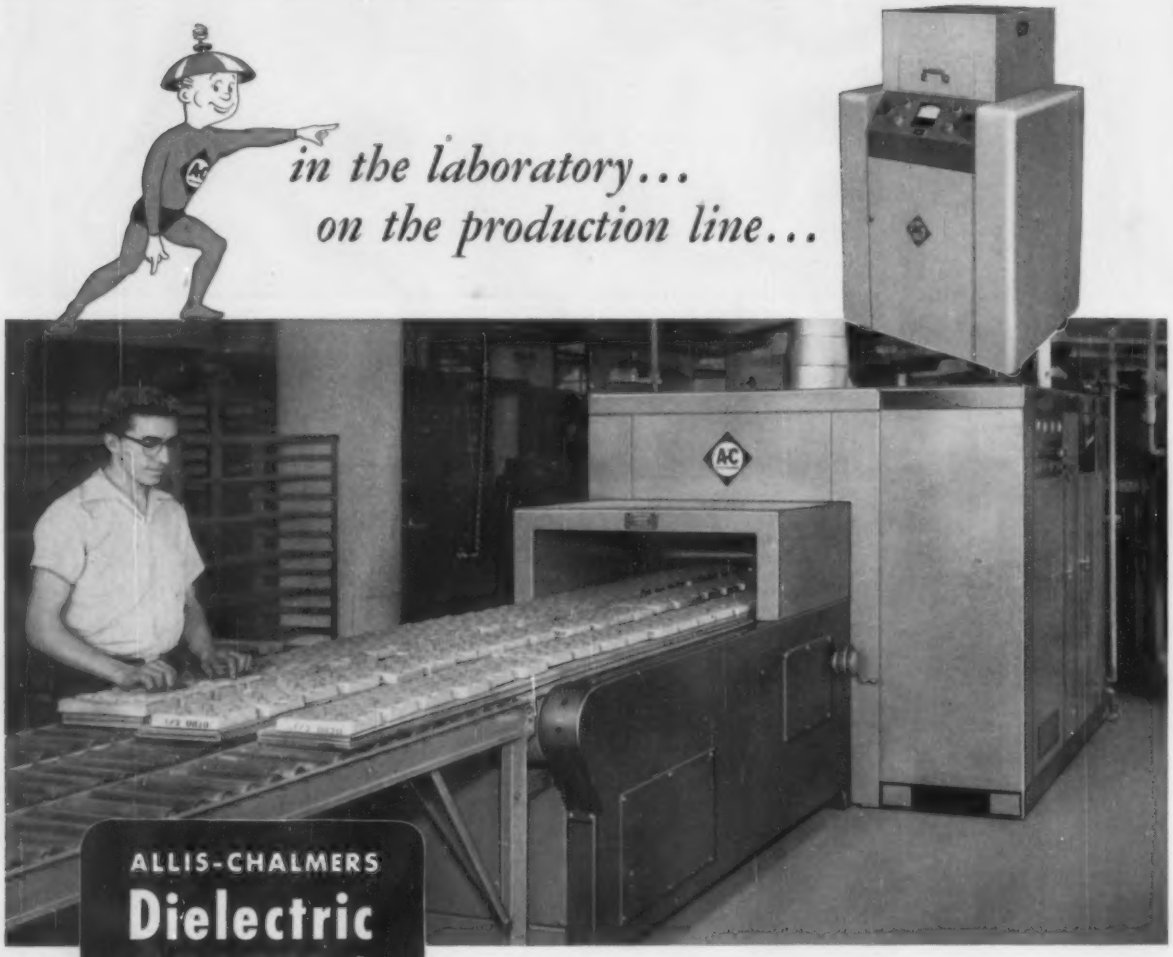
With all the experience in Web Processing these 130 years in business simply

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NEW BRUNSWICK, NEW JERSEY
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Member of Society of Plastics Industry



Solve a Wide Range of Industrial Heating Problems

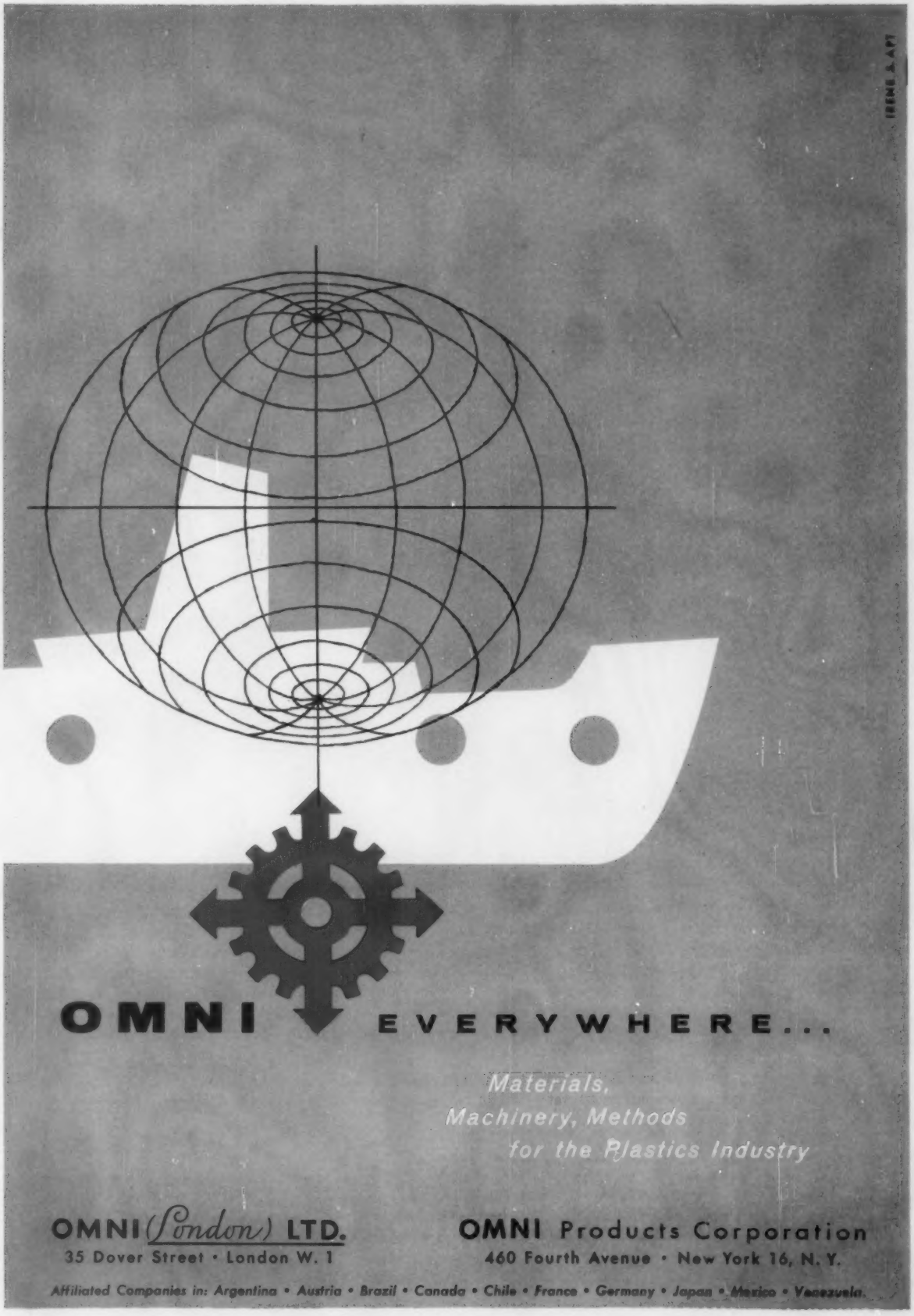
Maybe you're looking for that better way to apply heat in your laboratory research projects. Or — you could be concerned with speeding up production in the plant. Regardless of your problem, chances are Allis-Chalmers dielectric heating engineers have solved an identical or very similar problem. This specialized engineering experience is at your disposal. Why not use it?

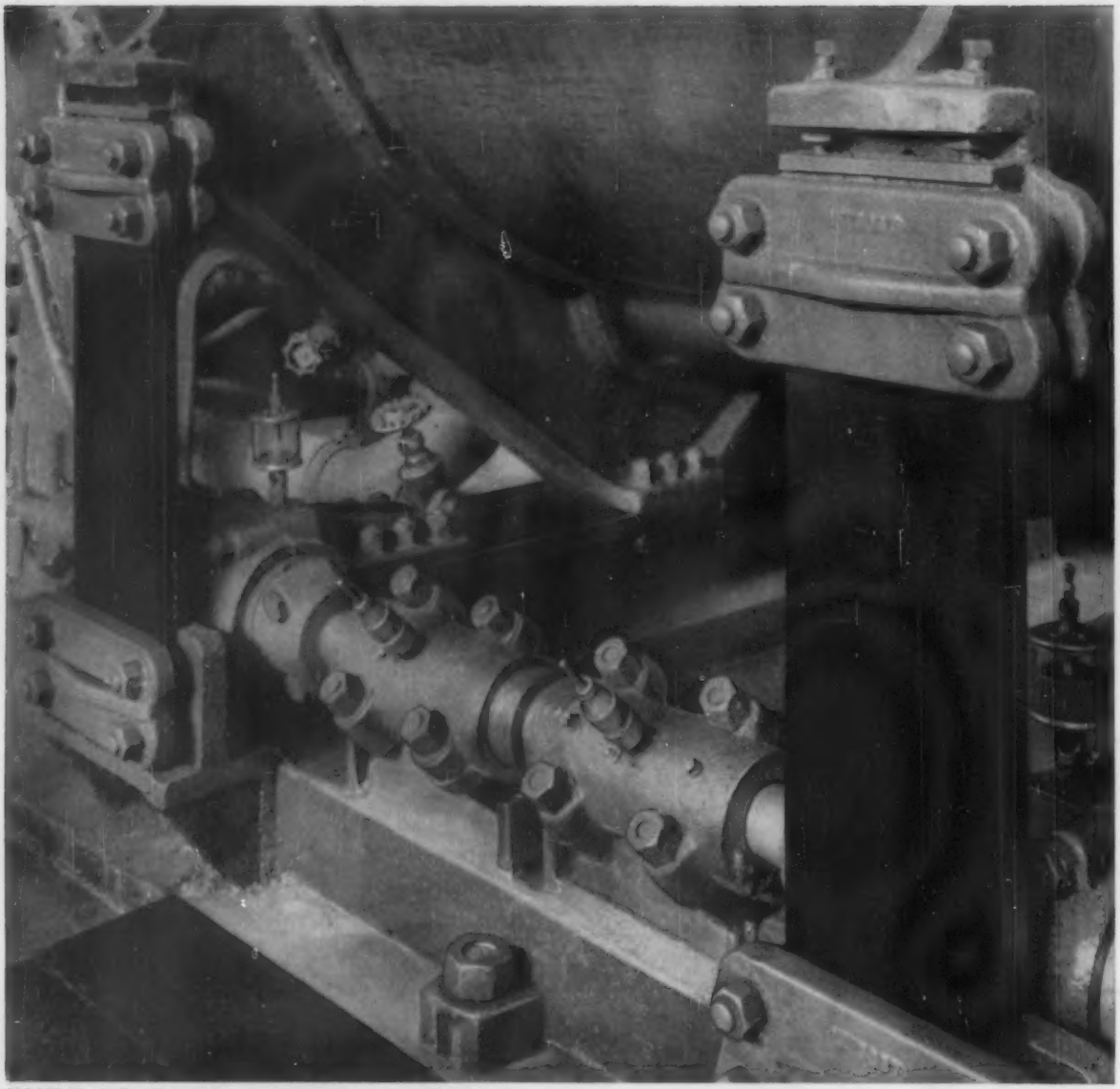
The Allis-Chalmers line of dielectric heaters for non-conducting materials extends from a 3-kw unit to 100-kw and larger machines. All sizes may be equipped with oven, cages, conveyors and other work handling accessories *designed by Allis-Chalmers* to meet your specific operating need.

For complete information, see your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletin 15B6431C.

ALLIS-CHALMERS

A-5302


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BUILT TO TAKE A BILLION BENDS – Four of these laminated plastic springs support the entire weight of a 1500 gallon oscillating tank on a Bird paper stock screen in operation at Taylor Fibre Co. of Norristown, Pa. When filled to capacity, the screen vat weighs 13,000 lbs., and is constantly oscillating at the rate of 300 cycles per minute for 24 hours a day, 6 days a week. During the more than 10 years that these springs or "shake boards" have supported the weight of this vat, each of them has been flexed more than a *billion* times – considerably more times than materials normally utilized for this purpose are expected to withstand. – And despite the humid conditions and constant presence of "free water", there has yet to be any sign of deterioration. The springs were made from one of Taylor Fibre Co.'s own laminated plastics in which Mount Vernon fabrics are used.

This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

UNIFORMITY Makes The Big Difference In Industrial Fabrics

Mount Vernon Mills, inc.

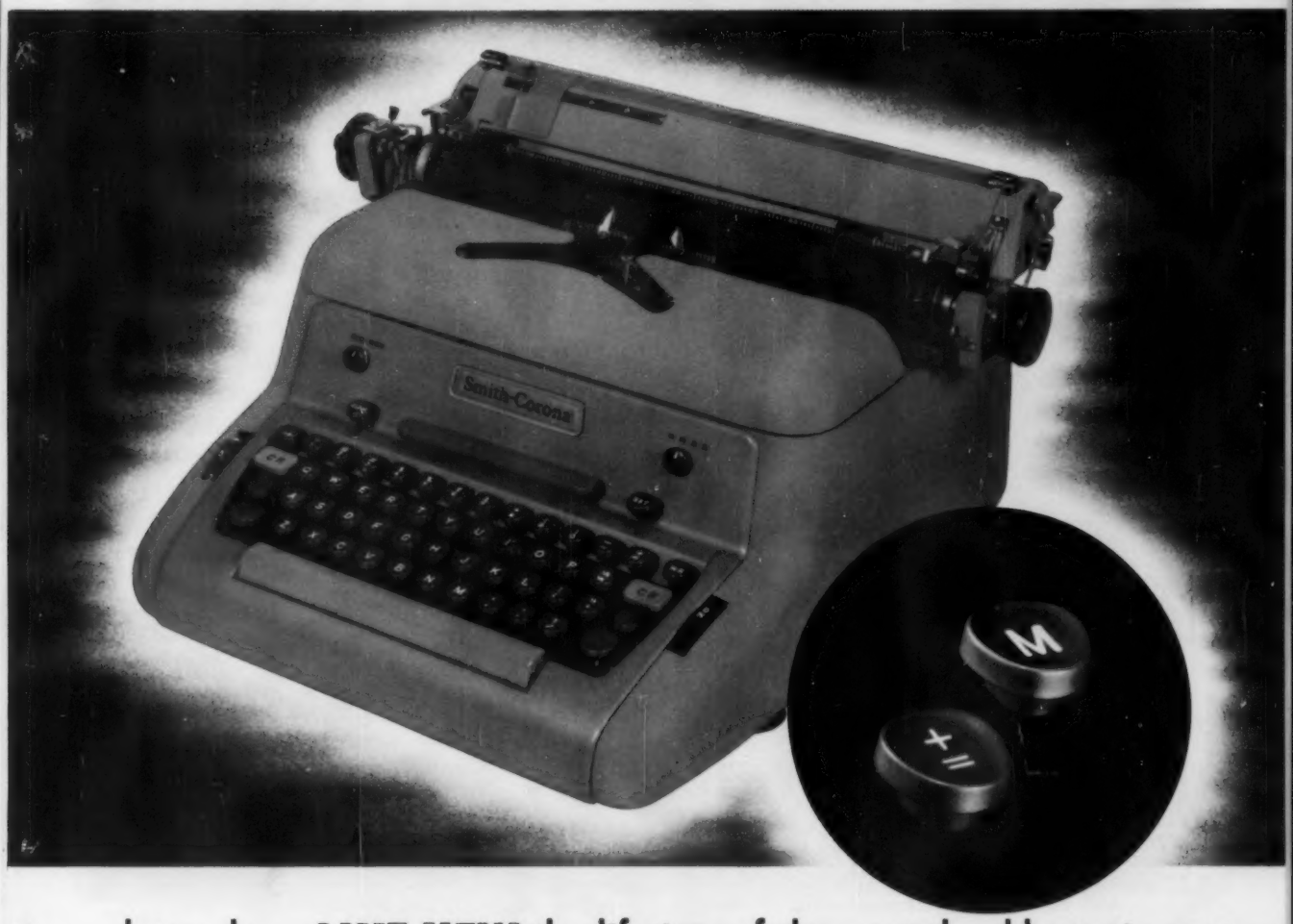
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Beauty That's More Than Skin Deep !

AMERICAN "DOUBLE-SHOT" INJECTION MOLDING



keeps keys **LIKE NEW** the lifetime of the most durable equipment

American's DOUBLE-SHOT Injection Molding *is the ideal way of producing plastic parts with indicia molded in—keys for typewriters, calculators and other business machines—tuning dials—character wheels for registers, speedometers, counters—wheels with cams and gears for special purposes and scores of other applications where permanent indicia is needed.*

Look closely at the keyboard, platen knobs, and other controls on this beautiful Smith-Corona typewriter. Note the clearness of the symbols and numbers. Look again at this same keyboard after years of hard service and you'll see the same "brand new" beauty. You'll find the keys just as brilliant . . . just as readable and indestructible. The secret is below the surface. These parts were formed by American Plastics which has mastered the patented process of Double-Shot Injection Molding.

With this process, letters, numbers and symbols are formed from a separate plastic part, not imprinted or filled in. Get the facts on this surprisingly economical process by *writing direct* to *American Plastics*, one of America's largest suppliers of Double-Shot Injection Molded parts. Address Dept. B.

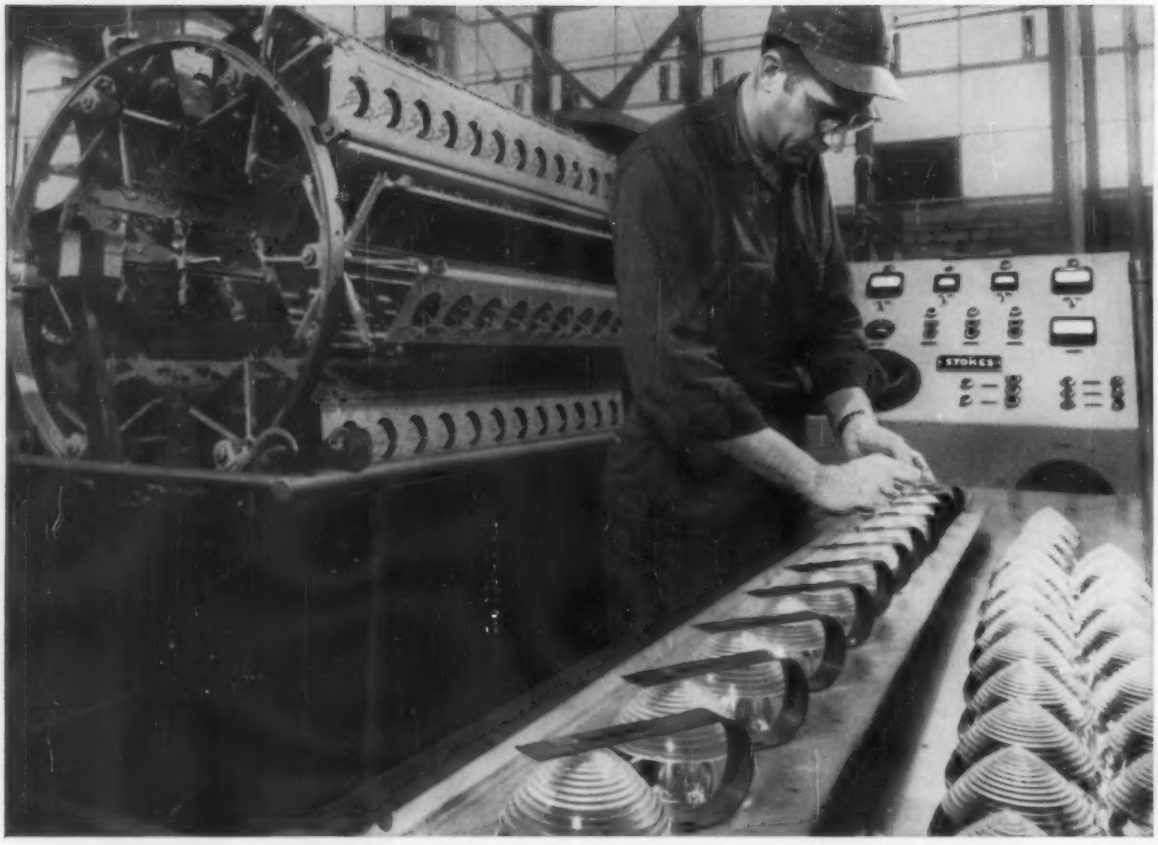
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PRECISION MADE

AMERICAN PLASTICS CORPORATION

A Subsidiary of Heyden Newport Chemical Corporation

EXECUTIVE OFFICES: 342 MADISON AVENUE, NEW YORK 17, N. Y.

PLASTICS PRODUCTION PARTNER OF AMERICA'S MOST PROGRESSIVE MANUFACTURERS



There's low-cost vacuum plating in FORD'S future . . .

Back-up light lenses, heater opening covers and medallions are products of the Parts and Equipment Manufacturing Division of FORD Motor Company. A Stokes Vacuum Metallizer is used to give these parts a bright, lasting trim.

Vacuum plating . . . often known as vacuum metallizing . . . can impart distinctive gold, brass, copper, or chrome finishes to a variety of parts at less cost than conventional plating. It makes it possible to coat non-conductive materials. Bright, lasting finishes can be given to parts that must withstand weathering.

The Stokes Model 426 Vacuum Metallizer, as used at FORD, handles around 430 three-inch diameter parts per batch—can deliver efficiently and economically on large or small parts. Interlocked centralized controls make it easy for men to learn the routine—to produce quality components with minimum attention. The equipment is compact and self-contained—takes little floor space.

Investigate Stokes Vacuum Metallizing equipment now—find out how low-cost metallizing can play an important role in your future. Contact your nearest Stokes office, or write for additional data on Stokes Vacuum Metallizing equipment.

Vacuum Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

new butadiene cars, too!



To keep pace with new production now coming on stream, we have substantially enlarged our fleet of modern tank cars. And to serve both rubber and chemical industry customers even more effectively, we are now completing a modern Research Laboratory and Pilot Plant at our Houston headquarters.

Largest non-captive producer of butadiene and related hydrocarbons, we welcome discussion of your potential needs for butane-derived petro-chemicals.



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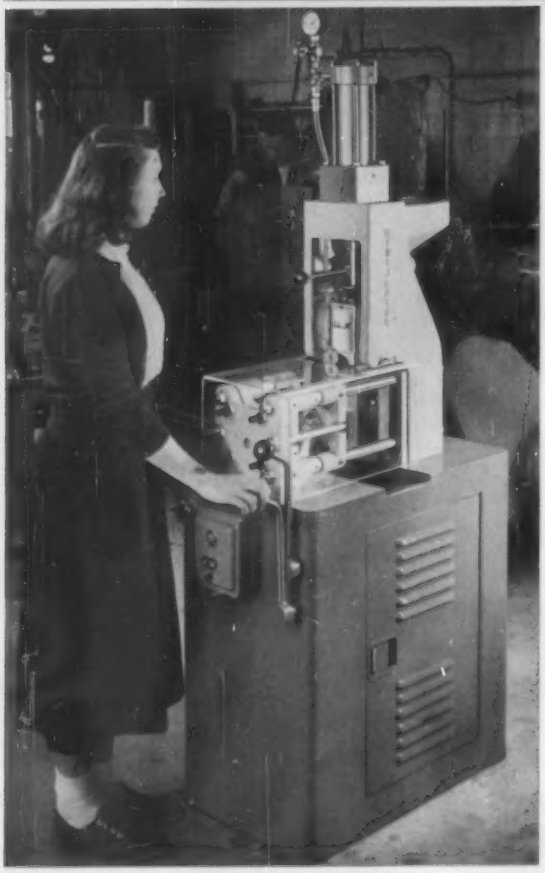
TENNESSEE GAS TRANSMISSION COMPANY AND FOOD MACHINERY AND CHEMICAL CORPORATION

MINI-JECTOR

TRADE MARK

PLASTIC INJECTION MOLDING MACHINES





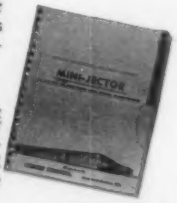
MODEL 60-PC 75 "Hornet" POWER OPERATED LEVER CONTROLLED. Mold size 6" x 5" x 5⅛"

MORE VARIETY at LOWER COST!

Saved: Thousands of dollars in mold costs with versatile, economical MINI-JECTOR. Eliminate "big press" high-per-piece tooling charges!

The more variety, the bigger the savings! Flexible, efficient, MINI-JECTOR Plastic Injection Molding Machines fill your need for low-cost development and production of fast-changing varieties of small molded plastic items. Savings begin with low initial investment of machine (under $2,000) and molds (as low as $29.50). Even more important are the bigger savings in time, trouble and money developing and producing "varieties" of different items by eliminating complex, costly big-press tooling where not required. MINI-JECTOR solves your tricky "insert" molding, too. Compact, simple to operate. Mold cap. 1/3 oz. to 1 oz., all thermoplastics and Nylon. Lever and push-button control models, air or hydraulic power to fit your facilities. Users claim MINI-JECTORS pay for themselves many times over in *savings alone.*

Bring your problems to Newbury! Our pilot plant can help you solve many of the difficulties in your small (up to 1 oz.) plastic item development and production.

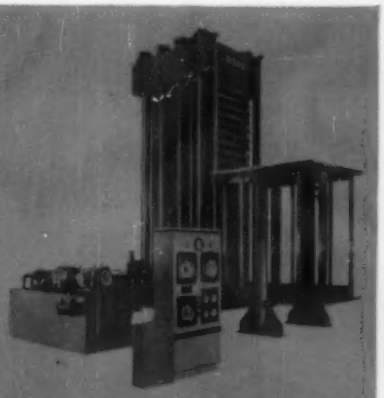


Write for Catalog today! "Tell-all" booklet, completely illustrated, shows entire line of MINI-JECTOR Plastic Injection Molding Machines and accessories. Learn how MINI-JECTOR adds new flexibility and economy to your plant operations.

NEWBURY INDUSTRIES Inc.

Box 382, Newbury, Ohio

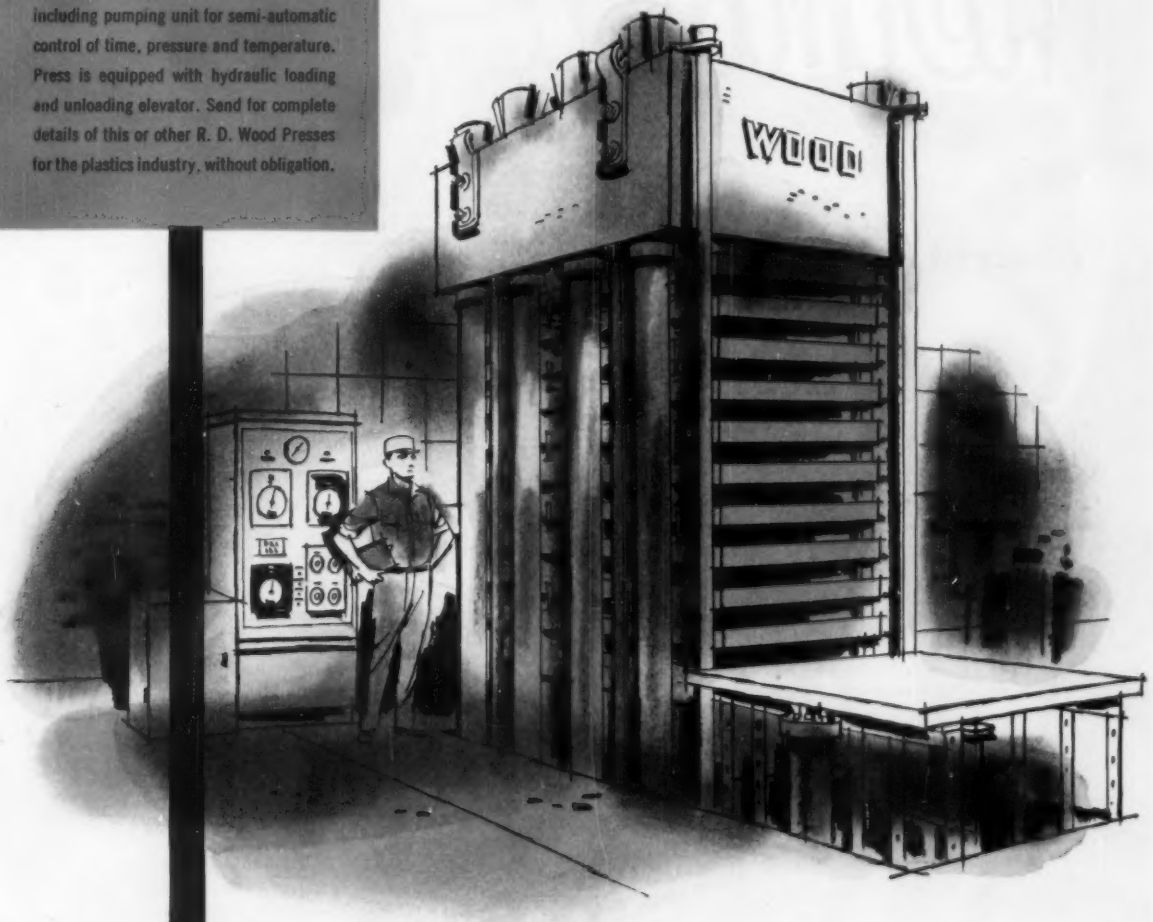
"Plastic Injection Molding Machines up to One Ounce Capacity"



2,000-ton R. D. Wood Hydraulic Press for laminating and polishing plastics. Press has 10—4" openings, platen size 42"x83", and is of the completely self-contained type, including pumping unit for semi-automatic control of time, pressure and temperature. Press is equipped with hydraulic loading and unloading elevator. Send for complete details of this or other R. D. Wood Presses for the plastics industry, without obligation.

The most productive plants use R. D. Wood Presses

For proof, look at production records—and downtime for maintenance. Then watch an R. D. Wood Press at work. See for yourself the smooth, precise operation—the dependable performance—even under tough conditions. Finally, inspect an R. D. Wood Press up close. Notice the soundness of design, the excellence of materials, the scrupulous care given to each detail of construction. These are the reasons why R. D. Wood Presses are the standard of excellence throughout the plastics industry.



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Thermolite 112*

**Patent applied for*

. . . an entirely new concept in barium-cadmium stabilization

. . . complete freedom from fatty acids and octoates

Thermolite 112 is used in:

film and sheeting . . . extrusions
. . . plastisols and organosols.

CLEAR VINYLS —to approach optical clarity with outstanding light stability —superior heat stability gives excellent initial color and holds color during processing—offers freedom from "plate out".

PIGMENTED VINYLS—initial color maintained with no color drift during processing.

Metal & Thermit now brings you an entirely new type of stabilizer for polyvinyl chloride film, sheeting, extrusions, and dispersions. Thermolite 112, the first barium-cadmium stabilizer completely free from fatty acids and octoates, offers heat and light stability, clarity, and heat sealing and printability characteristics heretofore unapproached by a barium-cadmium system. Hose manufacturers will be especially pleased at the increased water resistance and lower hazing with Thermolite 112.

For all applications, the unique chemical structure and physical properties of this new stabilizer provide unlimited opportunity for lowering costs and improving quality. "Plate out" on calender rolls is reduced to a minimum. Substantial savings result from the powerful action of Thermolite 112 permitting the use of very small quantities of stabilizer for many formulations. In some cases, Thermolite 166, our zinc stabilizer, can be substituted for part of the barium-cadmium, thus further reducing costs. Both of these new Thermolite stabilizers are liquid and can be added directly to the plasticizer, thereby eliminating costly grinding or pre-blending.

Literature providing details about Thermolite 112 and Thermolite 166 is available upon request.

HEADQUARTERS FOR HEAT AND LIGHT STABILIZERS: The M&T Thermolite line also offers the most complete selection of organotin heat and light stabilizers in the field. Write for details.

TIN & TIN CHEMICALS
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ORGANIC COATINGS
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PLATING MATERIALS
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HEAVY MELTING SCRAP

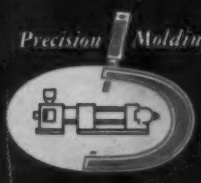
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give your plastic products the benefit of the

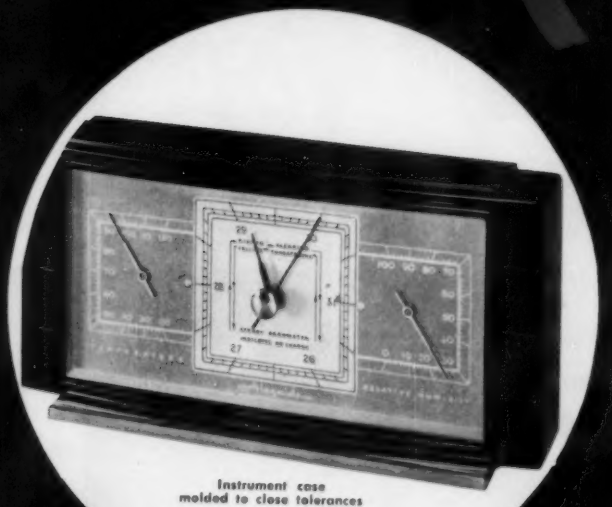
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Precision Molding

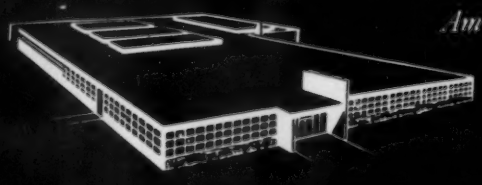


The Makray "OK" on your product is the result of a unique system of engineering, designing, molding and assembly room techniques that result in the best in plastics technology. But, while we are unique in the quality of painstaking craftsmanship and inspection that we apply to your products, we are completely competitive in price. Whether we originate the design or work from yours our objective is the same: To give you a plastic product that looks better, works better and sells better.

When you are in or near Chicago come out and visit us. You'll see why results are finer from America's finest injection molding plant. Or, call or write today for the complete story on the Makray "OK"



Instrument case molded to close tolerances



America's finest, most modern plastic molding plant

- 24-hour operation assures speedy delivery
- 26 latest Hi-speed presses . . . 8 oz. to 60 oz. capacity
- Precision molds designed and built in our own shop
- Complete engineering service to serve you . . . save you money

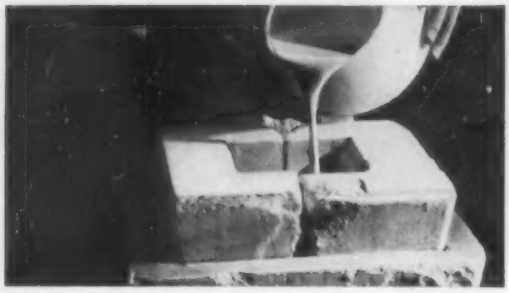
MAKRAY MANUFACTURING COMPANY

Precision Plastic Molders

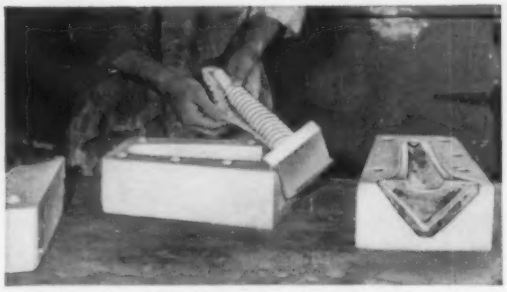
4400 North Harlem Ave., Chicago 31, Ill. • GLadstone 6-7100

HOW VERTOL AIRCRAFT FORMS HOLLOW PLASTIC AND NEOPRENE PARTS WITH NEW BESTWALL BREAKAWAY PLASTER





Here Bestwall Breakaway Plaster is being poured into a plaster mold at the Vertol Aircraft Corporation plant at Morton, near Philadelphia. This is the first step in making an expendable Breakaway mandrel on which a polyester laminate compass support will be formed.



Another use for Breakaway Plaster at Vertol. A Breakaway mandrel, used to make a neoprene power plant control boot in a Vertol H-21C Helicopter, is removed from a rubber forming mold. Molds for casting mandrels of Bestwall Breakaway Plaster may be of metal, wood, rubber or plaster.



Workman applies parting agent to Breakaway Plaster mandrel to prevent adhesion of the plaster to the neoprene part. Lighter pieces in background are the plastic laminates applied over the mandrels. Darker pieces at the right have been coated with neoprene and are ready for curing.



Here the Bestwall Breakaway Plaster is being washed out of the molded power plant control boot after the curing operation. Water at 170° F. quickly flushes the expendable Breakaway mandrel from the most intricate shapes without malforming or breaking the part.

Bestwall's new, improved Breakaway Plaster is a gypsum base composition specially formulated for the production of hollow shapes formed of glass fiber mats reinforced with resins. With this new formula, excellent results can be obtained more quickly and easily, and at less cost than ever before.

Before switching to Bestwall Breakaway Plaster, Vertol Aircraft Corporation used a material which had to be manually broken out. This sometimes caused a breaking or malforming of the part and resulted in waste and higher manufacturing costs.

Breakaway Plaster can be quickly and easily *washed* out of the most intricate shapes with hot water or steam. It is readily adaptable to any contour.

Whatever your requirements, Bestwall and its distributors are ready to work closely with you, and to recommend the specific industrial plaster that will improve your product or raise your plant efficiency.

Write or call the nearest Bestwall Certain-teed Sales Office now for the name of your distributor. See the list of offices below.

BESTWALL T.M.

Manufactured by Bestwall Gypsum Company
SOLD THROUGH
BESTWALL CERTAIN-TEED SALES CORPORATION
120 East Lancaster Avenue, Ardmore, Pa.
EXPORT DEPARTMENT: 100 East 42nd St., New York 17, N.Y.

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SALT LAKE CITY, UTAH
TACOMA, WASH.



See why customers prefer soft goods wrapped in glass-clear films made from Spencer's new exclusive 2400 series polyethylene.

Are You Using This *New* Glass-Clear Polyethylene?

New Spencer 2400 film grade resins also are stiffer and easier to handle, yet cost nothing extra:

Extruders are now switching to a new, glass-clear film produced from the exclusive "Poly-Eth" 2400 series resins. And they report that by actual comparison, this film is twice as clear as conventional polyethylene film, and it has a higher gloss.

This means greater package beauty than has ever before been possible for soft goods wrapped in polyethylene film. It means no color dulling due to semi-opaque film. Every color, every line is as sharp and clear as though you were looking at it through a window.

The film is stiffer, too! Test it yourself—twist it, crumple it in your fingers. You'll find that film made from a "Poly-Eth" 2400 series resin is the stiffest standard film you can buy today!

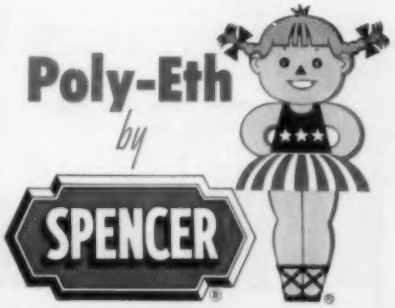
Also, it's easier to feed this film into bag machines. And, because of its extra stiffness, it's easier to stack the finished bags. Excellent runs have been processed at 0.4 mil thickness with both blown and flat film.

You get faster filling when you use this film, because it opens so much more easily. Test it with your fingers. Discover for yourself how free it is from tack and clamminess. And because it is less permeable, it is extra suitable for laminating.

Tailored to your needs, this new "Poly-Eth" 2400 series resin comes in three different compounds: 2405 has no slip, 2425 has medium slip, and 2455 has high slip.

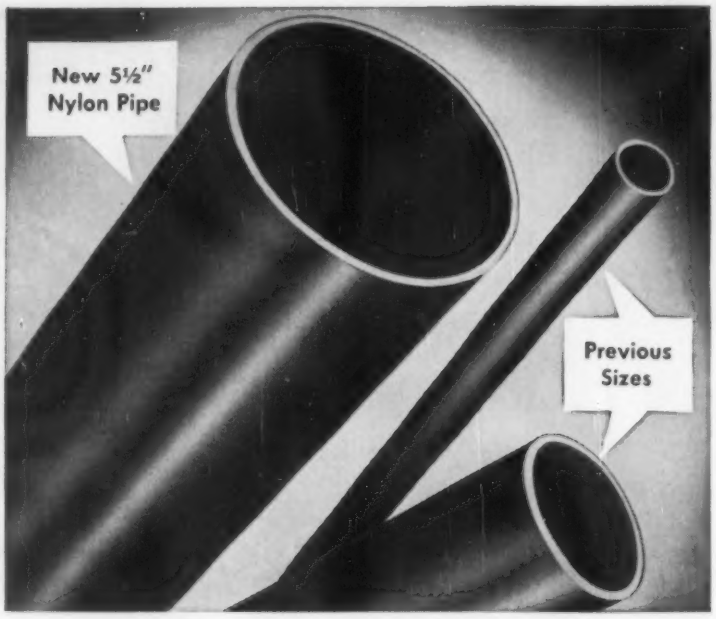
This is the answer to a packager's dreams: the durability of regular polyethylene combined with *extra* stiffness, plus *glass-like* clarity. Yet a "Poly-Eth" 2400 series resin costs no more than regular polyethylene! If you're interested in film for soft goods, textiles, candy, or bakery goods, find out more about this newest forward development in packaging.

Write today to Spencer Chemical Company, creators of these exclusive new "Poly-Eth" film resins. We'll be glad to send you full details without obligation. Just drop a line to Spencer Chemical Company, Dwight Bldg., Kansas City 5, Missouri.



SPENCER CHEMICAL COMPANY
Dwight Bldg., Kansas City 5, Mo.

BIGGER NYLON PIPE



Now with new Spencer Nylon you can make up to 5½" pipe that is:

- **Impervious to powerful chemicals, as well as oil, fats, and grease**
- **Not damaged even by live steam**
- **Not harmed by liquids under pressure**
- **Durable as metal in many applications**
- **Lighter than metal and many other plastics**

Here's a new way to make money! A new nylon pipe, that dwarfs all earlier nylon pipes, offers you a whole new world of profit opportunities! And you can now make giant nylon pipe with new Spencer Nylon!

Nylon has always been an ideal pipe material. Unlike other plastics, nylon withstands high pressure and even live steam. It has superior chemical resistance and is also impervious to hydro-carbons like fats and oil.

But with old-type nylon it has been practical to make only small-diameter tubing. At extrusion temperature *ordinary* nylon runs like water, and extruding large objects with it is out of the question.

New Spencer Nylon solves the problem! Because it has an unusually wide processing range for nylon, it's easier and safer to handle, and less likely to degrade during processing. And because it has a greater plasticizing range, it sets up more slowly, which, to a high degree, prevents voids. As a result, it is now possible to make dependable nylon pipe with diameters up to 5½".

Big nylon pipe is already in use. On ships, for instance, its ability to withstand high pressure makes it perfect for high pressure deck lines. Because of its chemical inertness, it serves excellently for salt water wash down lines and sewer pipes.

Petroleum is another industry where big nylon pipe shows great promise. Because nylon is impervious to oil, it can be used as casing when electromagnetic instruments are lowered far under the earth's surface to study the potentialities of oil or gas formations. This system is already in use in the Near East. Unlike steel, it won't mask logging instruments. And unlike other plastics, nylon withstands the intense temperatures found in the depths to which the instruments are lowered.

Wherever there is need for pipe that withstands heat, pressure and abrasion, that resists powerful chemicals as well as hydro-carbons, yet has plastic light weight and high strength —chances are mighty good there is another spot where nylon pipe has a profitable future.

And the best nylon for pipe is new Spencer Nylon! New Spencer Nylon has the highest-controlled specifications of any nylon on the market today! That's because it is manufactured by continuous polymerization instead of by the old-fashioned "batch" process.

A multi-million pound plant, now under construction in Henderson, Ky., will soon be ready to supply you with Spencer Nylon. To meet existing demands, Spencer now offers AKU-manufactured shipments of this same superior nylon in eight grades.

If you'd like to share nylon's profitable future, contact Spencer's Research and Development Department. Spencer Chemical Company is already leading the plastics industry with the first commercially-available high density polyethylene, and a new premium pipe grade polyethylene.

Now the same outstanding staff of experts who produced these advances are ready to give careful consideration to your problems or questions, and to offer you suggestions for new markets. Just write to Spencer Nylon, Spencer Chemical Company, Dwight Bldg., Kansas City 5, Mo.

NOW! NYLON *by* SPENCER

SPENCER

SPENCER CHEMICAL COMPANY

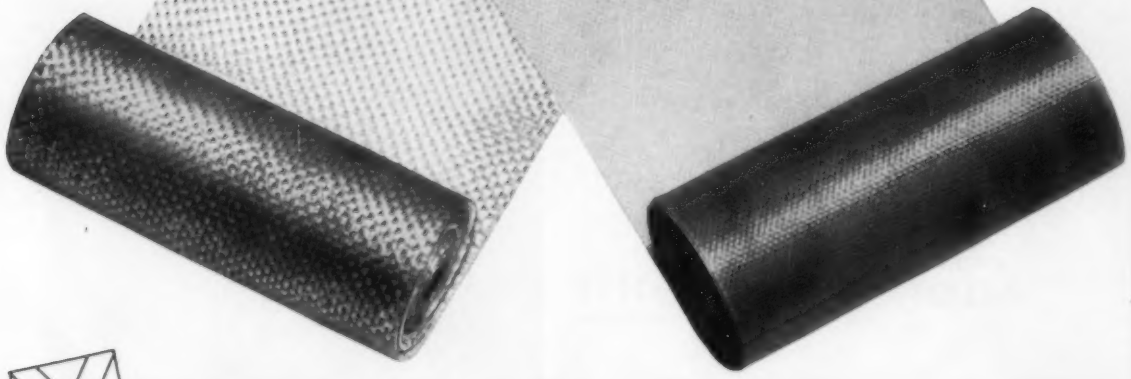
GENERAL OFFICES: DWIGHT BUILDING, KANSAS CITY 5, MISSOURI

send for technical data on

IMPREGNATED GLASS FABRICS FOR HIGH TEMPERATURE APPLICATIONS 60° F TO 10,000° F

Trevarno Silicone (F-130), Epoxy (F-160) and Phenolic (F-120) materials have been tested and proved for high-temperature, high-strength missile and aircraft applications. They give optimum heat resistance and strength performance in addition to exceptional electrical and mechanical properties. Chopped high temperature material is available for molded parts for performance at 4,000°F.

In addition to high-temperature, high-strength products, Trevarno glass fabrics are available impregnated with Polyester (F-58), Phenolic (F-92) and Epoxy (F-150) resin systems for general, all-purpose molding. Custom materials can also be developed with fabric weight, weave, thickness and impregnation to suit your individual specifications.





SEND COUPON FOR DATA ON IMPREGNATED MATERIALS TO SUIT YOUR NEED

COAST MANUFACTURING AND SUPPLY COMPANY
P. O. Box 71, Livermore, California

Please send me data on materials for the temperature ranges or resin systems I have checked below:

☐ 60°F to 160°F	☐ Phenolic	☐ Fabric
☐ 160°F to 750°F	☐ Epoxy	☐ Chopped Fabric
☐ 800°F to 1500°F	☐ Silicone	
☐ 1500°F to 10,000°F	☐ Polyester	

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4065

Trevarno
GLASS FABRICS

modernizing sheet production

eliminate lamination by using

ROBBINS SHEET POLISHING UNIT

and do this for your production:

1

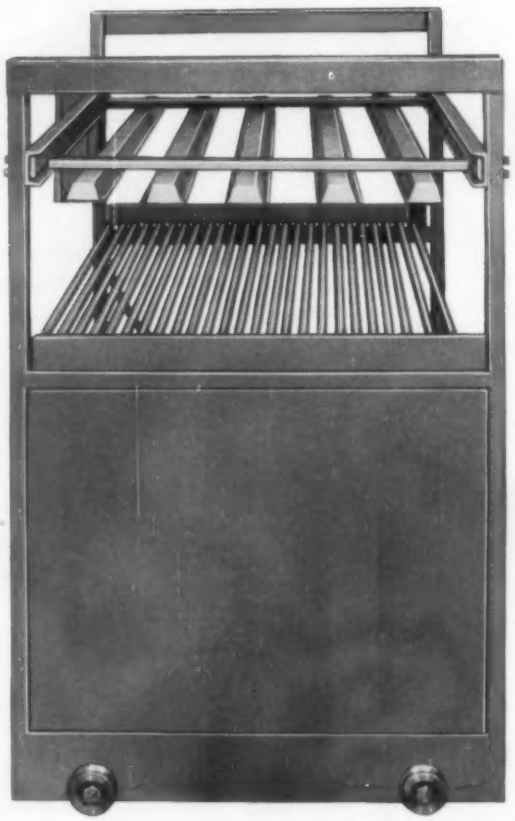
By polishing rather than laminating you get full output from your extruder.

2

You get a uniform polish without wrinkle and pit-holes.

3

By not having to purchase lamination material you cut cost of end product.



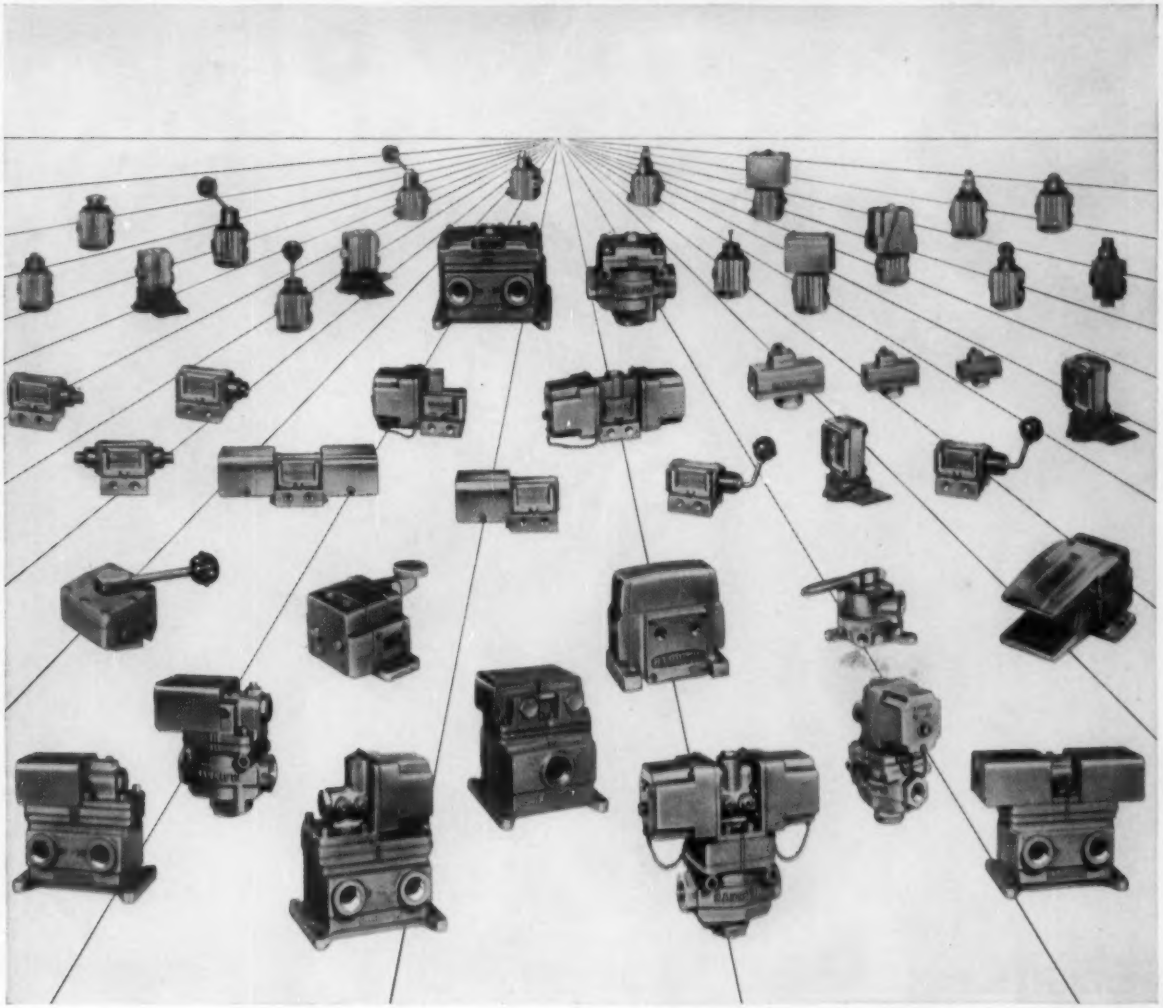
Robbins Sheet Polishing Unit is self-contained with all component parts and controls included in the price of the machine. *Write for further information.*

Robbins
never say die . . . say Robbins die

PLASTIC MACHINERY CORP.

1430 MISHAWAKA STREET

ELKHART, INDIANA



These valves like tough jobs

Discriminating engineers are finding that out. More and more of them are specifying Hannifin valves for every kind of directional air control—including the really tough jobs.

There are plenty of reasons why: Inspired simplicity of design. Fewer parts—and *those* easily and quickly replaceable. Ability to serve a wide range of applications with fewer valve models. And—above all—fast, smooth operation.

Your Hannifin man will gladly give you the whole story. We'll tell you where to get in touch with him—after you examine the big Hannifin catalog.

AIR CONTROL

HANNIFIN

VALVES



For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Corporation, 553 South Wolf Road, Des Plaines, Illinois.



For clearer clears, for brighter bright colors in vinyl film and sheeting...

New "Dutch Boy" Stabilizers

"Dutch Boy" research has done it again.

This time with two *new* stabilizers, outstanding for:

① **clarity**
② **economy**
③ **easy use**

One of these new "Dutch Boy" stabilizers, Flomax* 25 is a barium-cadmium organic. It's the one to give clears, vivid blacks, or colored translucents extraordinary heat and light stability. It contributes extremely high resistance to yellowing and to plateout.

The other, "Dutch Boy" Nalzin*, is an equally remarkable zinc organic co-stabilizer. When stain resistance is a must, Nalzin replaces a portion of the barium-cadmium organic.

Both of these stabilizers protect clarity and color during processing. Both prolong these values during product use.

Economical to Use

In cost, in efficiency, both Flomax 25 and NALZIN are the improvements you've been looking for.

They're easy to incorporate, as well . . . liquid, miscible in and compatible with common plasticizers and solvents, ideal for calendered resins.

If you make stocks for shower curtains, tablecloths, luggage, upholstery, pocketbooks and the like, get a rundown on Flomax 25 and Nalzin. And on four other "Dutch Boy" non-lead Stabilizers for stocks of this type. Write for the new "Dutch Boy" Stabilizer Handbook.

*Trademark

Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N. Y.
In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West, Montreal

these 3 fine steels

cover the entire range of your plastic mold requirements

HOTFORM—the nationally known hot work steel for aluminum, magnesium and white metal die casting—withstands erosion, resists fire-checking, and air hardens from a relatively low temperature without excessive scaling. This steel can be exposed to working temperatures up to 1000° without softening. It is highly resistant to thermal shock, and combines strength with toughness.

Hotform

SPEED-CUT is a free-machining die steel furnished heat treated ready for use as die casting dies for white metal alloys, plastic mold plates, die shoes, backing plates and many other applications. Its alloy content is sufficient to produce hardnesses of 275 to 325 Brinell for sizes as large as 20″ x 10″ on cooling in still air—machining very readily at such hardness.

Speed Cut

MC (Mold and Cavity steel) is provided heat treated and ready for use for plastic mold cavities, die casting dies and a wide range of other uses where a highly polished finish is desirable. MC is a medium carbon-alloy steel with very deep hardening qualities. It is painstakingly produced to avoid sulphides and other non-metallic inclusions, permitting high polish in plastic mold cavities without pits or blemish.

MC

Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

SUBSIDIARIES: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni • EUROPEAN ASSOCIATES: Societe Commentryenne Des Aciers Fins Vanadium-Alloys (France) • Nazionale Cogne Societa Italiana (Italy)

WANTED:
A light, low-cost airfoil for high speeds

PROBLEM:

Lightness, strength, smoothness, and the ability to withstand elevated skin temperatures—all these are highly desirable in airfoil structures. In addition, low cost and ease of fabrication are important factors from the designer's point of view.

SOLUTION:

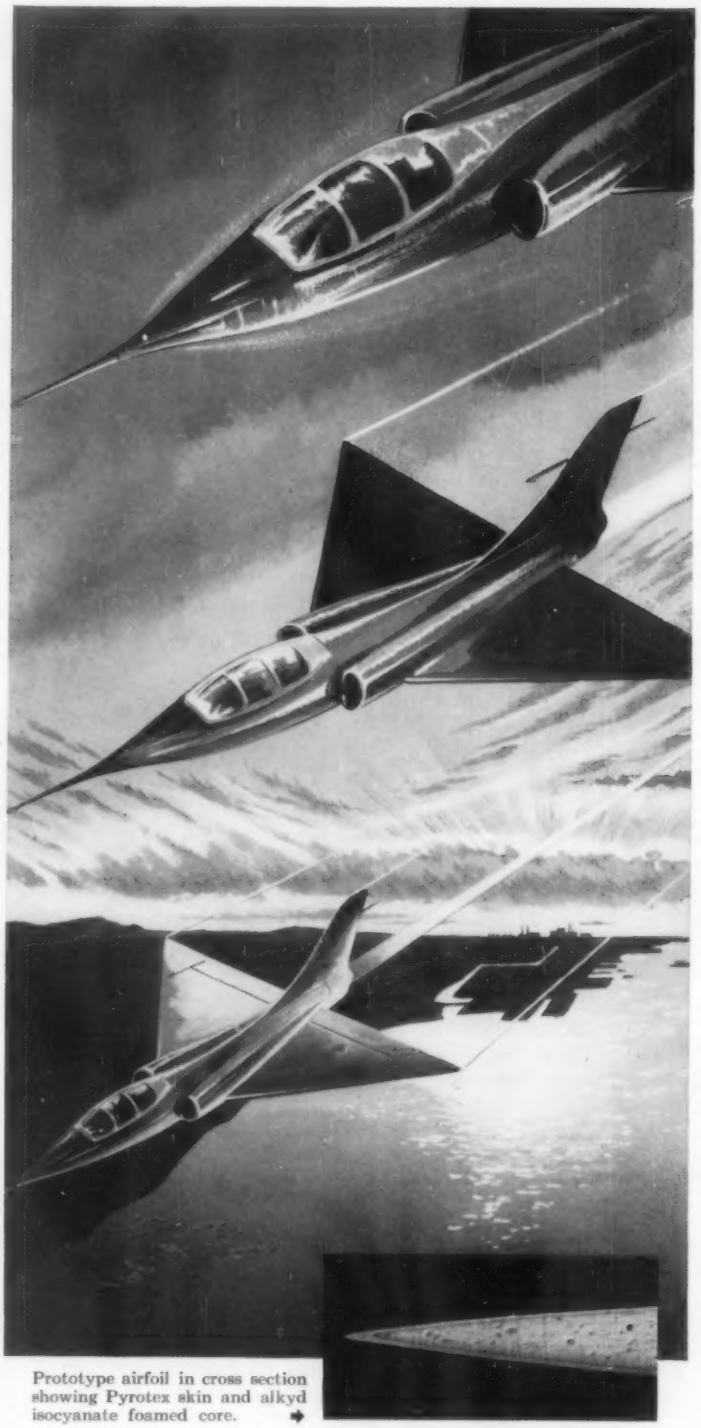
As designers of high-speed aircraft and missiles have discovered, excellent results are obtained from use of R/M Pyrotex Felt impregnated with phenolic resin as the skin for sandwich structures. In these applications, the greater stiffness of Pyrotex makes it superior to glass-reinforced plastics.

R/M's OUTSTANDING LINE OF REINFORCED PLASTICS

If your design demands the following features, find out more about the new family of R/M reinforced plastics (felts, mats, papers and molding compounds).

1. Excellent resistance to heat and flame
2. High modulus of elasticity from low to high temperatures
3. High strength from low to high temperatures
4. Smooth, abrasion-resistant surfaces
5. Exceptional dimensional stability
6. Elimination or reduction of surface crazing of resins
7. Good insulation and thermal properties
8. Economical to fabricate

For further information, please write for technical bulletins



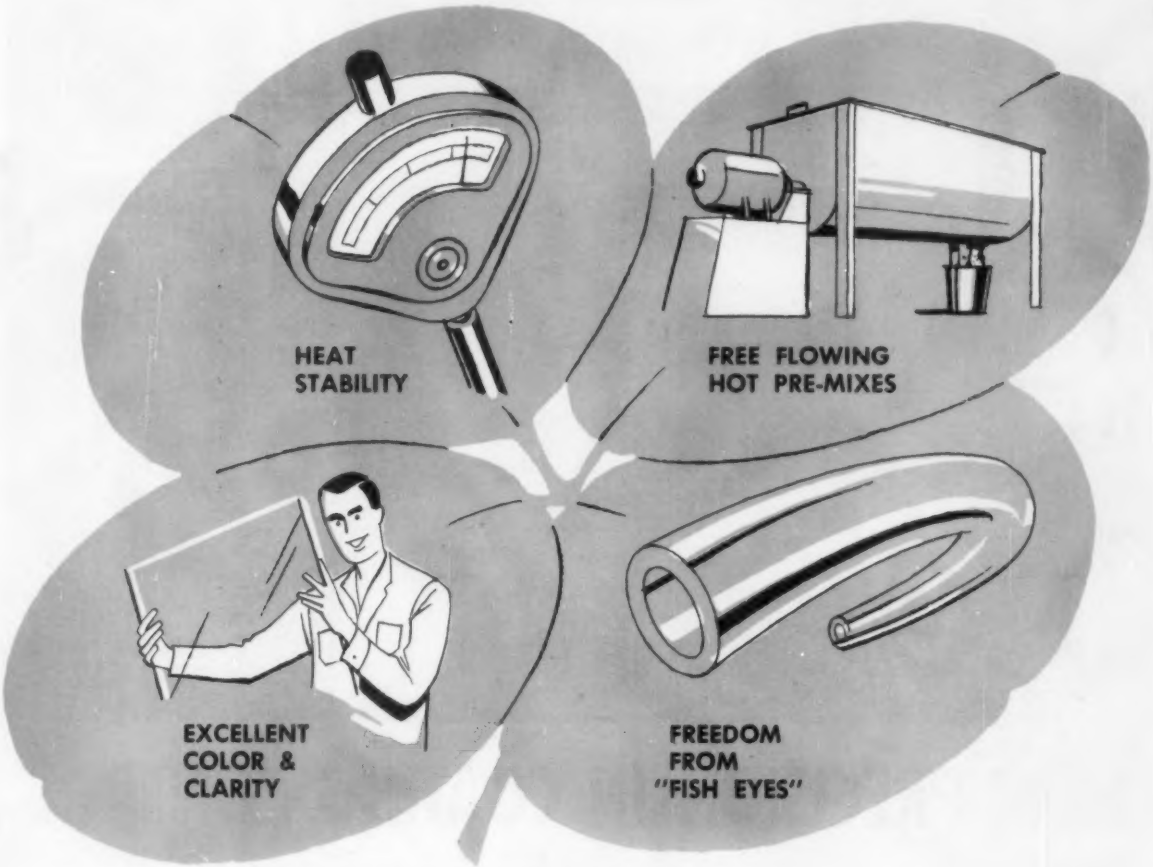
Prototype airfoil in cross section showing Pyrotex skin and alkyd isocyanate foamed core. ➔

RAYBESTOS-MANHATTAN, INC.

ASBESTOS TEXTILE DIVISION, MANHEIM, PA.

FACTORIES: Manheim, Pa.; Bridgeport, Conn.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Asbestos Textiles • Laundry Pads and Covers • Mechanical Packings • Brake Linings • Brake Blocks • Clutch Facings • Rubber Covered Equipment Industrial Rubber • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Abrasive and Diamond Wheels • Bowling Balls



LOOKING OVER A 4 LEAF CLOVER

In seeking ways to improve your product, look at these four advantages offered by Escambia PVC 1250:

- Outstanding heat stability with its advantages in quality control.
- Free-flowing hot pre-mixes.
- Excellent color and clarity.
- Freedom from "Fish-Eyes."

Other new polyvinyl chloride resins include.

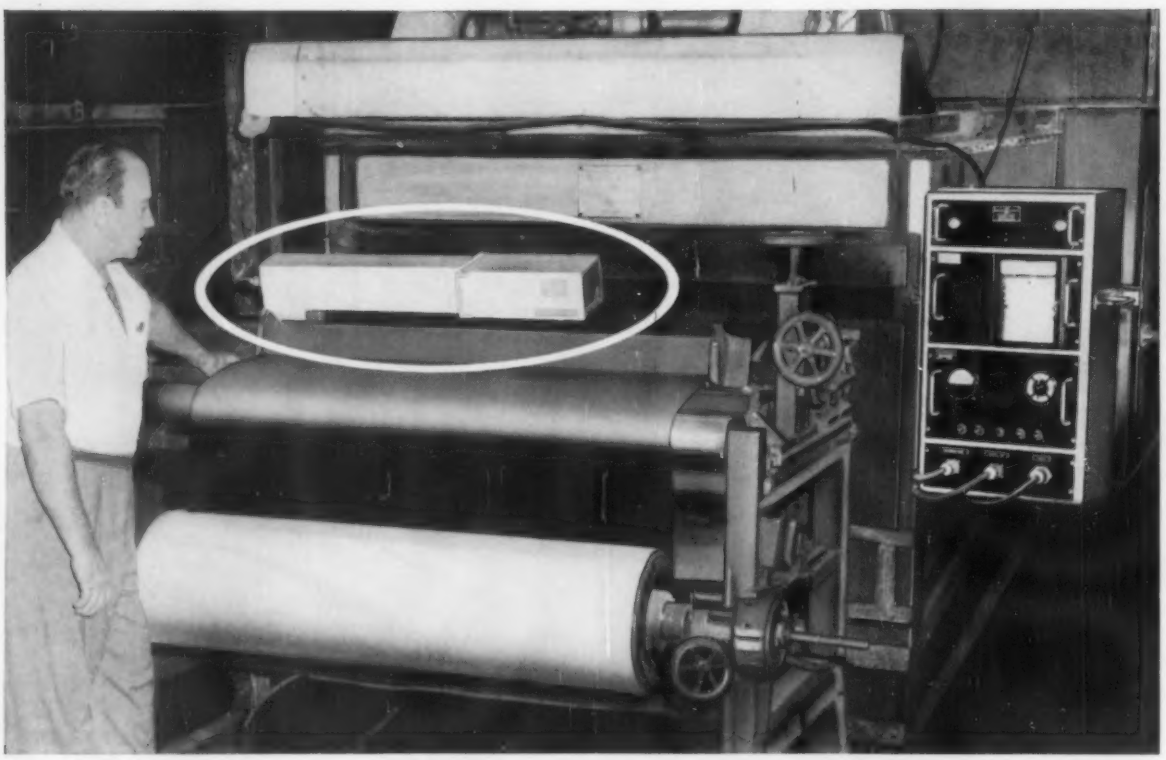
ESCAMBIA PVC 1225—intermediate molecular weight resin particularly adapted for supported and unsupported sheeting.

ESCAMBIA PVC 1200—low molecular weight for flexible and rigid sheeting.

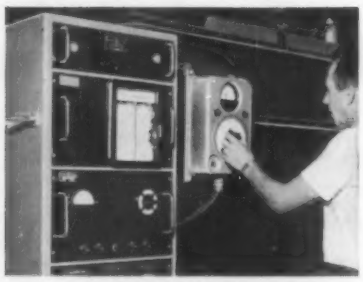
For additional information about Escambia's new resins—write the address below on your letterhead—

ESCAMBIA CHEMICAL CORPORATION

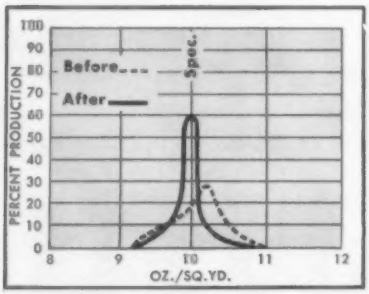
261 MADISON AVENUE • NEW YORK 16, N. Y.



NEW PRECISION IN COATING CONTROL



Machine operator adjusts target selector to proper weight specification for each order. Target meter acts as constant guide, indicating variations immediately.



Before installation of the Curtiss-Wright System, only 55% of plastic produced came within ± 2% of the target weight of 10 oz./yd.² After installation, 86% of total production met specification.

With CURTISS-WRIGHT Systems

Tested and proved in the most exacting production applications, Curtiss-Wright non-contact measuring systems and controls monitor plastic film, sheet and coated stocks continuously. They record actual production quality, signal instantly any variations that occur and make correcting adjustments automatically in the production equipment.

Weight variations across the sheet and throughout the reel are greatly reduced. It is unnecessary to overshoot "to be sure". Start-ups and order changes are faster and "cocked-roll" runs eliminated. You save in time and materials, reduce scrap losses, produce a more uniform sheet. A wide choice of mounting designs permits installations custom-made to your conditions and budget. Write for complete details.

Curtiss-Wright has career positions open for qualified engineers and technicians

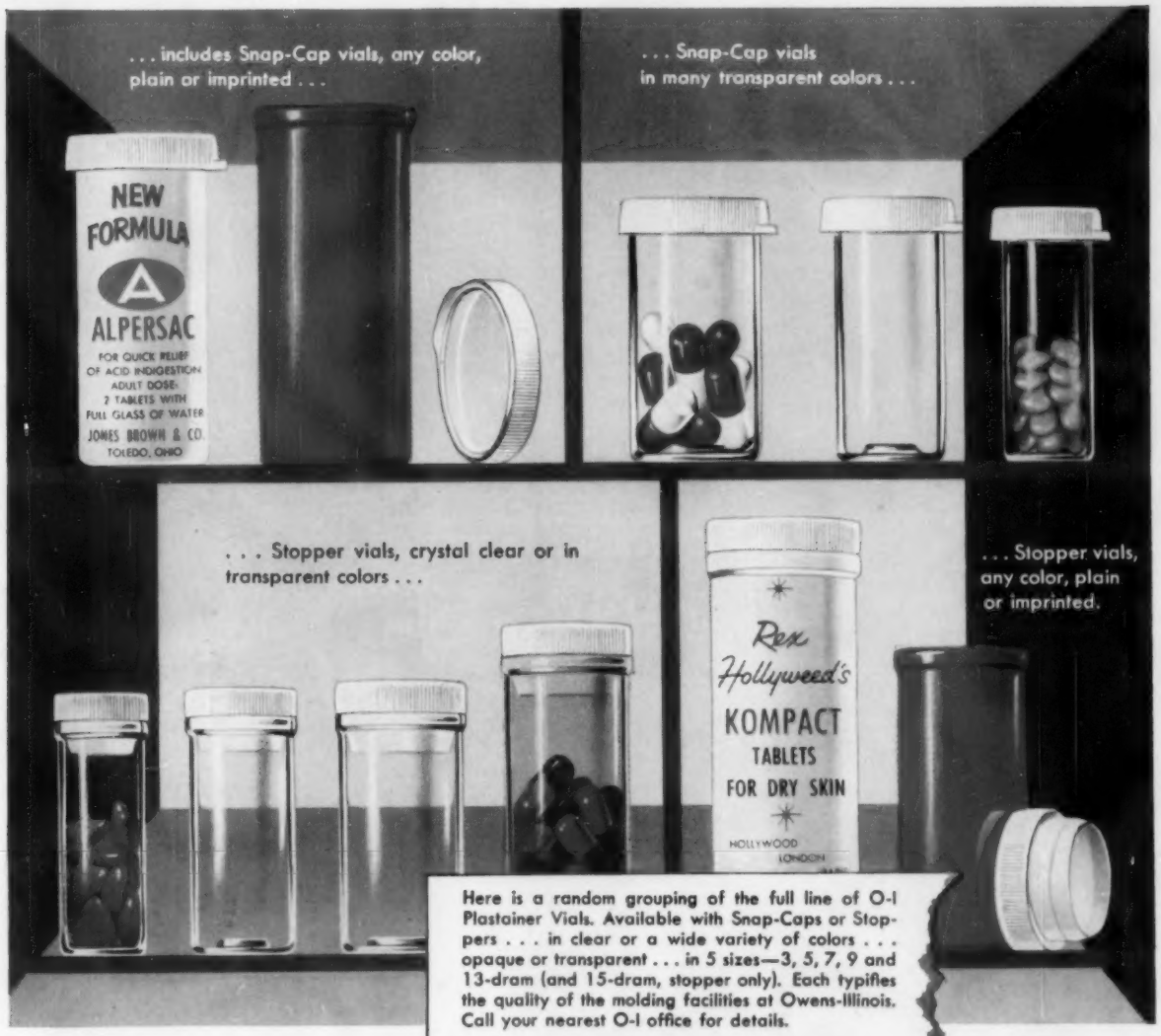
ELECTRONICS DIVISION
CURTISS-WRIGHT
CORPORATION · CARLSTADT, N. J.

WEST COAST REPRESENTATIVE:
Western Dynamics Co., 444 Dexter Horton Bldg., Seattle 4, Wash.

CANADIAN REPRESENTATIVE:
Electronics Associates, Ltd., 4616 Yonge St., Willowdale, Ont.

Systems Frieseke & Hoepfner

NEW FULL LINE of Plastainer Vials by Owens-Illinois



Here is a random grouping of the full line of O-I Plastainer Vials. Available with Snap-Caps or Stoppers . . . in clear or a wide variety of colors . . . opaque or transparent . . . in 5 sizes—3, 5, 7, 9 and 13-dram (and 15-dram, stopper only). Each typifies the quality of the molding facilities at Owens-Illinois. Call your nearest O-I office for details.

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Atlanta . . . Georgia	Denver . . . Colorado	Milwaukee . . . Wisconsin	Richmond . . . Virginia
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Birmingham . . . Alabama	Elkhart . . . Indiana	New Orleans . . . Louisiana	Sacramento . . . California
Boston . . . Massachusetts	Fresno . . . California	New York . . . New York	St. Louis . . . Missouri
Buffalo . . . New York	Hartford . . . Connecticut	Oakland . . . California	St. Paul . . . Minnesota
Charleston . . . West Virginia	Houston . . . Texas	Oklahoma City . . . Oklahoma	Salt Lake City . . . Utah
Charlotte . . . North Carolina	Indianapolis . . . Indiana	Omaha . . . Nebraska	San Francisco . . . California
Chicago . . . Illinois	Jacksonville . . . Florida	Peoria . . . Illinois	Seattle . . . Washington
Cincinnati . . . Ohio	Kansas City . . . Missouri	Philadelphia . . . Pennsylvania	Toledo . . . Ohio
Cleveland . . . Ohio	Los Angeles . . . California	Pittsburgh . . . Pennsylvania	Yakima . . . Washington
Columbus . . . Ohio	Louisville . . . Kentucky		

Pacific Coast Headquarters, 350 Sansome St., San Francisco . . . Plants at San Jose, Calif., St. Charles Ill., Glassboro, N. J., and Riverdale, N. J.

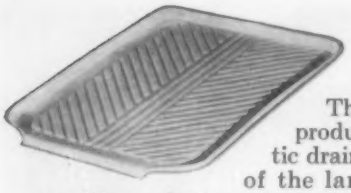
OWENS-ILLINOIS PLASTICS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

even for the big ones it's

CRUCIBLE CSM 2

. . . from warehouse stock



The mold which produced this plastic drainboard is one of the largest plastic molds ever built on the west coast. A block of CSM 2 was the steel used . . . obtained from local *Crucible warehouse stock*. L. D. Plastic Tool and Die Co., South Gate, California, built the mold for Alladin Plastics, Inc., Los Angeles.

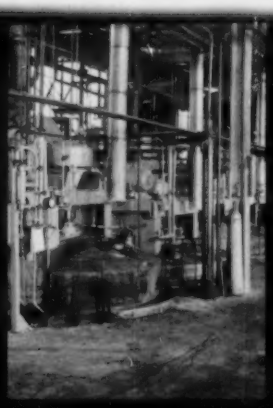
CRUCIBLE CSM 2 was the choice for two big reasons—*quality* and *convenience*. Ultrasonic inspection of *every* piece, regardless of size, insures unvarying quality. And regular stocks of 205 different sizes of CSM 2, carried in Crucible warehouses, means *fast* delivery whether your application calls for a pound or several tons.

Next time you need mold steel, call your nearest Crucible warehouse. The steel you want will be in your plant in a matter of hours. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*



CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



PARAPLEX / *polymeric* • **MONOPLEX** / *monomeric*

plasticizers

FROM ROHM & HAAS COMPANY

Compounders of vinyl products can choose from a variety of Rohm & Haas plasticizers ranging from monomeric esters—MONOPLEX plasticizers—to complex, high molecular weight polymers—PARAPLEX plasticizers. Used alone, or in combination, Rohm & Haas plasticizers offer vinyl compounders distinctive processing and performance benefits.

Whether your product demands plasticizers with resistance to migration, stability against heat or light, very low volatility, flexibility at low temperatures, resistance to extraction by a variety of solvents, both organic and aqueous, or good electrical properties, Rohm & Haas plasticizers can do the job effectively and economically.

Whether you are making floor tile or baby pants, high frequency cable jacketing or garden hose . . .

here's what you should know about **PARAPLEX** and **MONOPLEX** plasticizers →

Paraplex *polymeric plasticizers*

Paraplex G-25

- ***unexcelled permanence***
- ***excellent compatibility***
- ***high resistance to ultra-violet light***

Paraplex G-25 is a high molecular weight plasticizer which imparts exceptional permanence. Properly stabilized vinyl compounds which contain Paraplex G-25 plasticizer are outstanding in durability. Paraplex G-25 has excellent resistance to extraction by gasoline, oil, water, soap and detergents, as well as freedom from migration in contact with lacquer, alkyd and varnish finishes. Compatibility with vinyl resins is excellent. Original physical properties are retained even after prolonged service at elevated temperatures.

Typical uses include: high grade upholstery sheeting and coated fabric, refrigerator gaskets, surgical tapes; insulation resistant to high temperature, coaxial cable, window channeling, electrical tapes.

Paraplex G-40

- ***high resistance to migration into rubber***
- ***high resistance to extraction by oil***

Paraplex G-40 is a high molecular weight polyester plasticizer which combines permanence of plasticizing action with moderate cost. Compounds in which Paraplex G-40 is used show good durability, as indicated by low losses due to volatility, resistance to extraction by aliphatic and aromatic hydrocarbons, and high resistance to migration into rubber and rubber-based materials. Paraplex G-40 is lighter in color than Paraplex G-25 but is not as compatible with vinyl resins at high plasticizer ratios.

Typical uses include: industrial hose and tubing, industrial and domestic flooring, shoe liners and counters, electrical tapes and industrial aprons.

Paraplex G-50

- ***good processing characteristics***
- ***very good over-all permanence***

Paraplex G-50 is a general-purpose polymeric plasticizer similar to monomeric plasticizers in its handling and processing characteristics. It is notably superior to dioctyl phthalate in resistance to extraction by oils and hydrocarbons, freedom from volatility, and resistance to migration into lacquers, rubber, and typical baked finishes. Vinyl compounds containing Paraplex G-50 are very stable, as evidenced by the retention of original properties after prolonged aging at high temperatures.

Typical uses include: insulation resistant to high temperature, upholstery sheeting, coated fabric, flooring, refrigerator gaskets, window channeling, surgical tapes, electrical tapes, shoe liners and counters, pigment dispersion vehicles, doll compounds.

Monoplex monomeric plasticizers

Monoplex DOS *(dioctyl sebacate)*

- ***outstanding performance at low temperatures***
- ***low volatility***
- ***resistance to extraction by soap and detergent solutions***

Monoplex DOS is an ester-type plasticizer widely used as a standard in vinyl compounds requiring flexibility at low temperature. It also provides low volatility, high plasticizing efficiency and excellent resistance to extraction by water, soaps and detergents. Like other plasticizers which impart low temperature flexibility, Monoplex DOS is susceptible to extraction by hydrocarbons and deficient on migration resistance. It is a very effective plasticizer for organosol and plastisol compounds.

Typical uses include: primary electrical compounds, sheeting and film for use at low temperatures, jacket compounds, strip-coating compounds.

Monoplex S-38

- ***excellent compatibility***
- ***low-cost permanence***

Monoplex S-38 is a low-cost primary vinyl plasticizer particularly noted for its good permanence properties. It is high in molecular weight and offers definite advantages over dioctyl phthalate. Monoplex S-38 is lower in volatility and better in resistance to extraction by oil and gasoline. Compounds exhibit excellent freedom from tack and exudation. Monoplex S-38 also proves helpful in improving the compatibility of secondary plasticizers.

Typical uses include: low-cost sheeting, flooring, automotive harness tapes, low-cost gasketing, electrical jacketing stocks.

Paraplex G-53

- ***high resistance to extraction by soapy water and oil***
- ***good compatibility at high levels of humidity***
- ***excellent resistance to marring of polystyrene***

Paraplex G-53, a relatively high molecular weight plasticizer, combines permanence and durability with the general handling and cost properties of a polymeric plasticizer of intermediate molecular weight. It possesses a high degree of resistance to extraction by aliphatic and aromatic hydrocarbons and to attack by soaps and detergents. Paraplex G-53 also is resistant to migration into and marring of lacquer, polystyrene, rubber-based compositions, and typical baked finishes. Compatibility with vinyl resins is very good.

Typical uses include: babywear, refrigerator gaskets, hospital sheeting, electrical and general-purpose tapes, insulation resistant to high temperature, upholstery sheeting, coated fabric.

Paraplex G-60

- ***excellent resistance to extraction by soap and detergent solutions***
- ***stabilization against heat***
- ***accepted by F. D. A. for food packaging***

Paraplex G-60 is a light-colored, high molecular weight, ester-type plasticizer which provides effective heat and light stabilization in vinyl chloride polymers, nitrocellulose lacquers, and chlorinated rubber compounds. It imparts good flexibility at low temperature, excellent soap and detergent resistance, and low volatility loss. Paraplex G-60 lowers stabilization costs of vinyl compounds and permits high temperature processing.

Typical uses include: general-purpose film, babywear, food packaging and tubing, upholstery sheeting, coated fabric, glove-dipping compounds, flooring.

Paraplex G-61

This plasticizer is generally similar in properties and uses to Paraplex G-60. It is superior in retention of compatibility on long term exposure, has better stability against light, and is more resistant to extraction by oil.

Paraplex G-62

- ***excellent stabilization against effects of heat and light***
- ***good general permanence properties***
- ***good resistance to soap and detergent solutions***
- ***accepted by F. D. A. for food packaging***

Paraplex G-62 is a high molecular weight plasticizer which combines good permanence properties with excellent stabilization against heat and light. It has low volatility, good resistance to extraction by soap and detergent solutions, and high compatibility over a wide range of concentrations and conditions. Permits fast calendering and low stabilization costs, provides uniform color and excellent resistance to embrittlement and discoloration.

Typical uses include: general-purpose film, upholstery sheeting, coated fabric, refrigerator gasket stocks, garden hose, doll compounds, food packaging and tubing, welting, primary insulation, jacket stocks, flooring, insulation resistant to high temperature, window channeling.

Monoplex S-70

- ***stabilization against effects of heat and light***
- ***good performance at low temperatures***

Monoplex S-70 is designed specifically to impart flexibility at low temperature. It is a very efficient plasticizer with good processing properties and a marked stabilizing effect. It has lower volatility than conventional plasticizers for low temperature applications. The stability imparted by Monoplex S-70 not only permits fast, high-temperature compounding, but also affords savings in stabilizer costs. Organosols and plastisols prepared with Monoplex S-70 are of low viscosity and have excellent viscosity stability.

Typical uses include: garden hose, film and sheeting for use at low temperature, slush-molding compounds, electrical jacket stocks, automotive insulation.

Monoplex DCP *(dicapryl phthalate)*

- ***general-purpose plasticizer***

Monoplex DCP is a general-purpose monomeric plasticizer having performance characteristics, in vinyl resins, virtually identical to those of dioctyl phthalate. While it shows less resistance to extraction by oil and gasoline and lower plasticizing efficiency, Monoplex DCP withstands degradation by heat, light, and outdoor exposure slightly better than dioctyl phthalate. In plastisol and organosol compounding, Monoplex DCP provides low viscosity, both initially and upon aging.

Typical uses include: general-purpose replacement for dioctyl phthalate.

compounds, strip-coating compounds.

CHECK THIS CHART OF PERFORMANCE PROPERTIES AT 1550 PSI MODULUS

PLASTICIZER GRADE	% Plasticizer to give 1550 psi modulus	Loss by Volatization	PERCENT EXTRACTION LOSS BY Oil	Gasoline	Soapy Water (90°C.)	Bend Brittle (°C)	Hardness (10 secs.)
PARAPLEX G-25	40.5	0.5	+0.3	0.2	0.2	−14	73
PARAPLEX G-40	45.0	1.2	0.3	0.0	—	+10	76
PARAPLEX G-50	41.0	1.3	3.5	3.5	6.9	−13	72
PARAPLEX G-53	42.5	0.7	1.5	1.8	3.5	−11	70
PARAPLEX G-60	37.5	0.3	7.0	10.5	0.1	−20	73
PARAPLEX G-61	38.0	0.3	5.5	9.8	0.2	−16	73
PARAPLEX G-62	38.5	0.3	4.5	8.5	0.3	−15	73
MONOPLEX DOS (Dioctyl Sebacate)	32.5	4.0	14.5	22.2	0.8	−50	79
MONOPLEX DCP (Dicapryl Phthalate)	37.5	8.0	17.5	22.5	7.5	−25	75
MONOPLEX S-38	38.5	1.5	3.0	12.0	17.4	−11	69
MONOPLEX S-70	32.0	6.5	19.0	20.0	7.2	−50	80
DIOCTYL PHTHALATE*	35.0	8.1	9.0	19.0	7.7	−26	74

*not offered—included as control value only.



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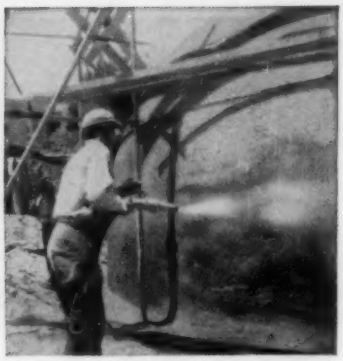
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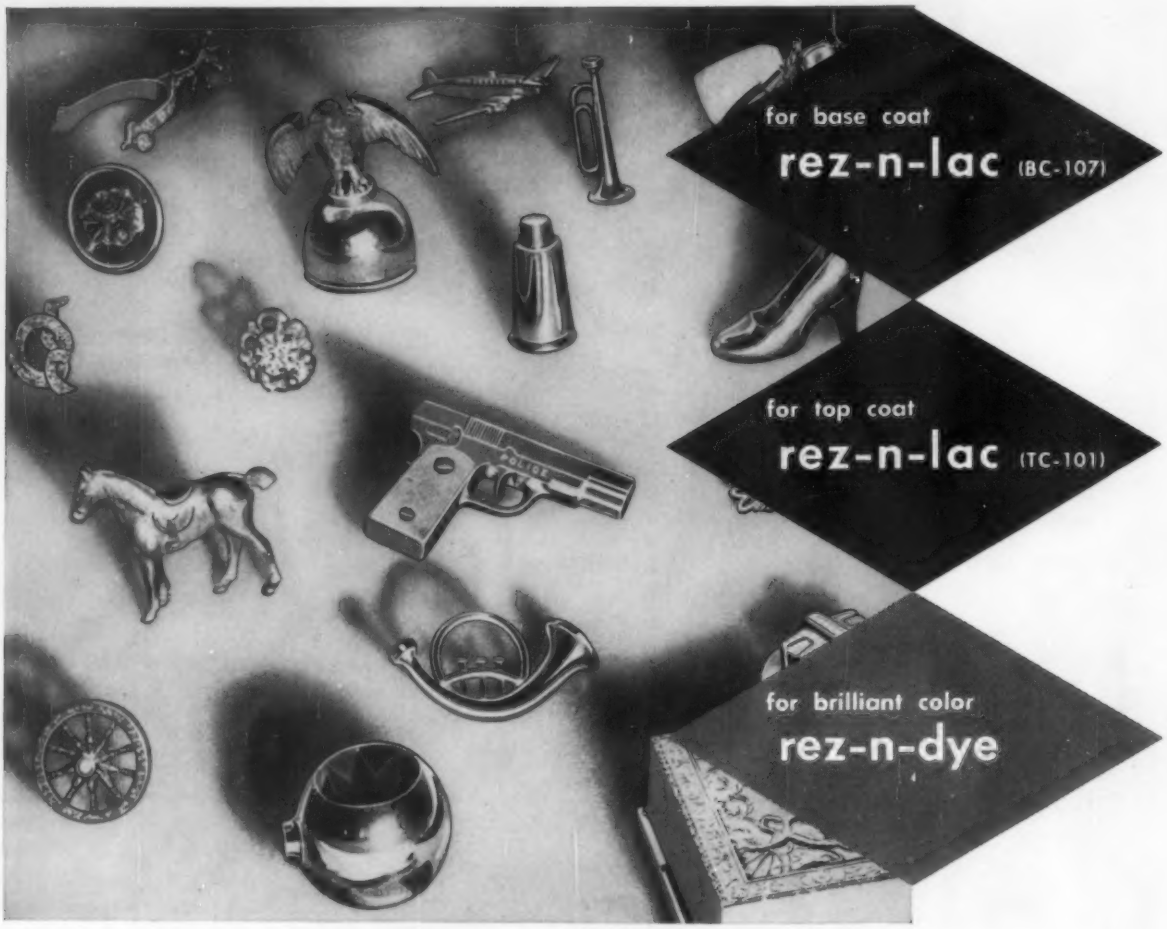
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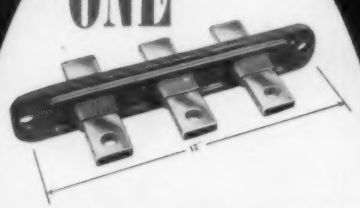
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U.S.I.

Vol. II, No. 3

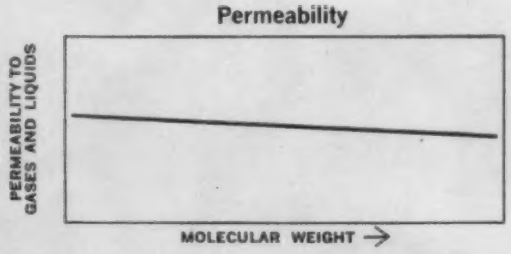
POLYETHYLENE PROCESSING TIPS

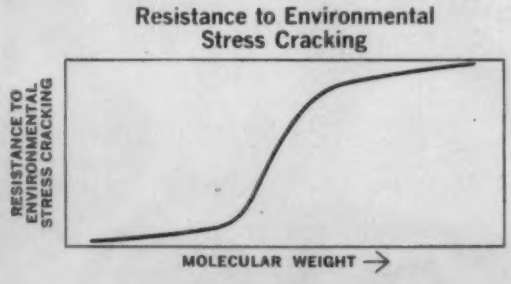
HOW MOLECULAR WEIGHT AFFECTS POLYETHYLENE PROPERTIES

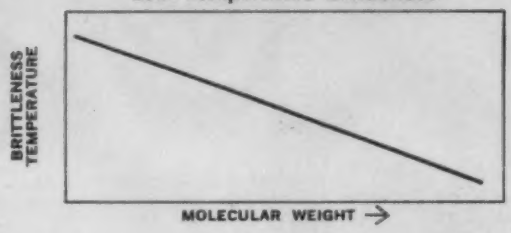
Molecular weight is one of the three most important resin characteristics that determine end-use properties of polyethylene. *Density* and *molecular weight distribution* are two others.

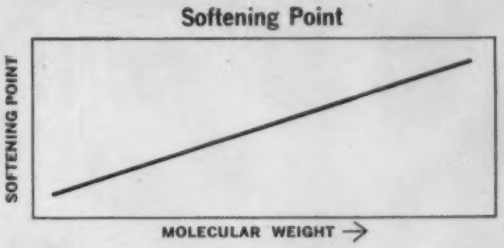
Melt Index is an approximate measure of molecular weight. Resins with low molecular weight have high melt index values, and vice versa.

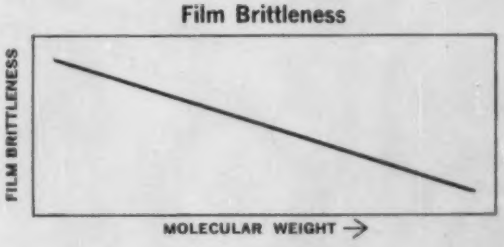
The following graphs show the effect of increasing molecular weight, (or decreasing melt index) assuming that density and molecular weight distribution remain constant. In practice, of course, these characteristics are different for different resins so the effects of all three must be considered.

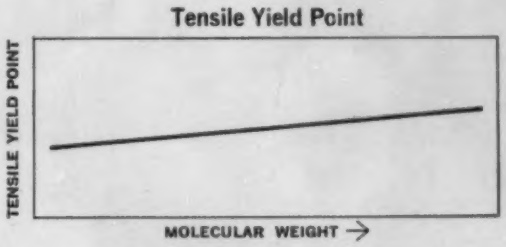


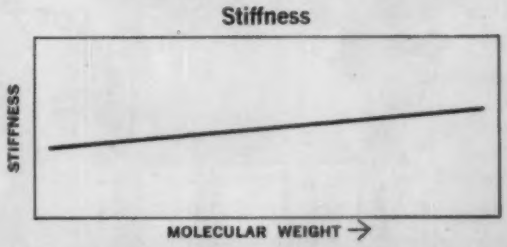










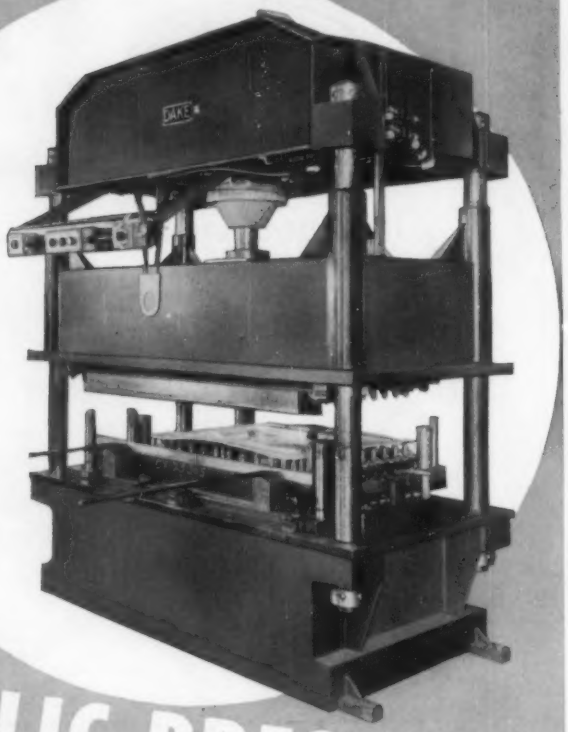


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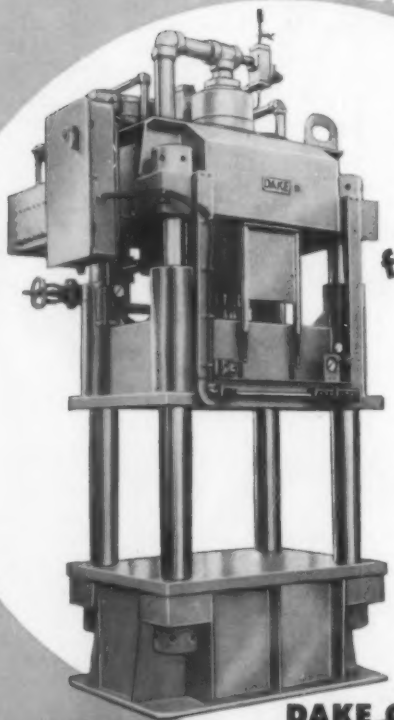
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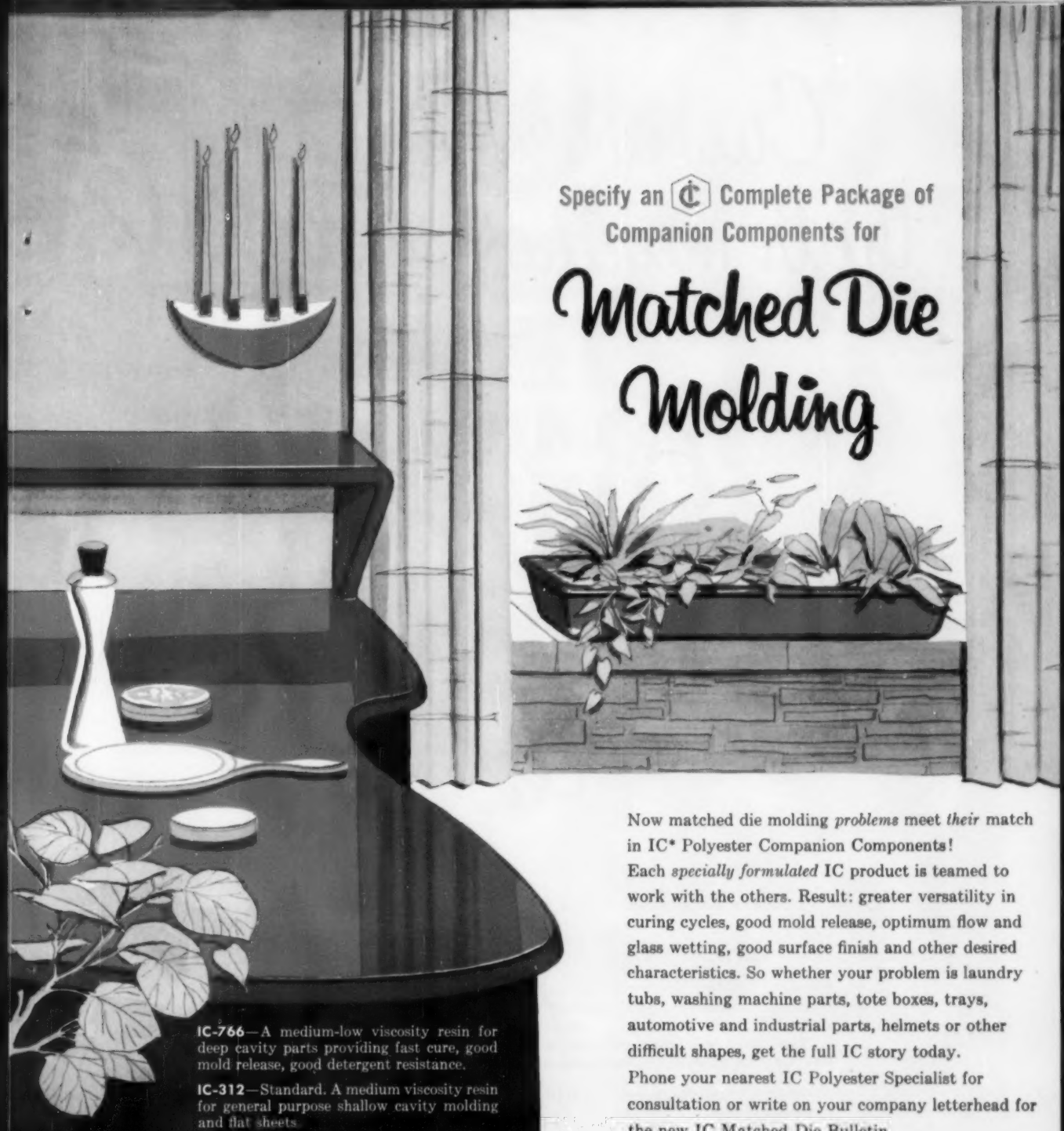

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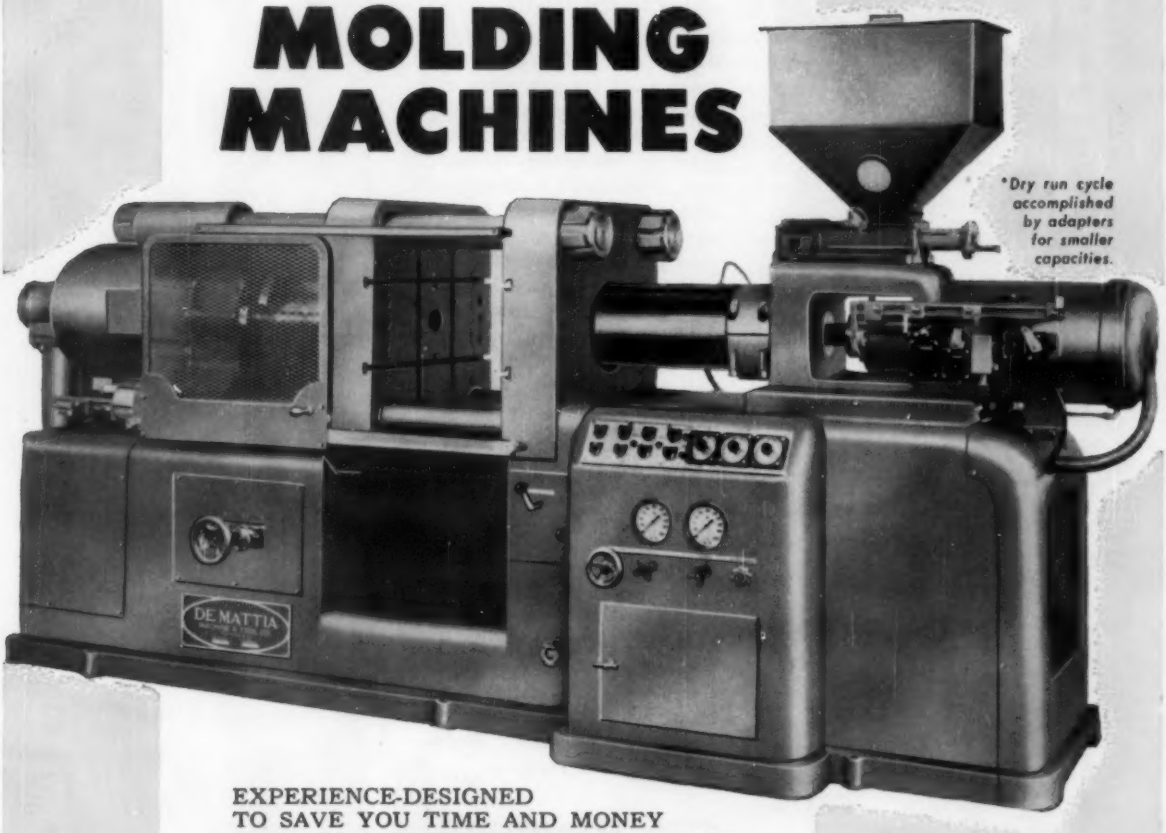
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Companion Machine For Mold and Die Millers

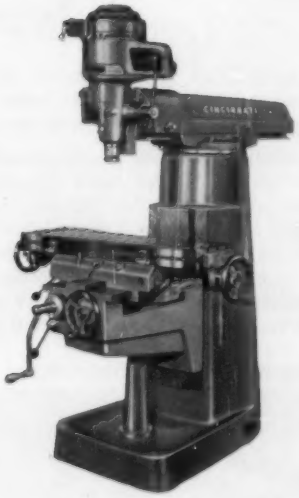
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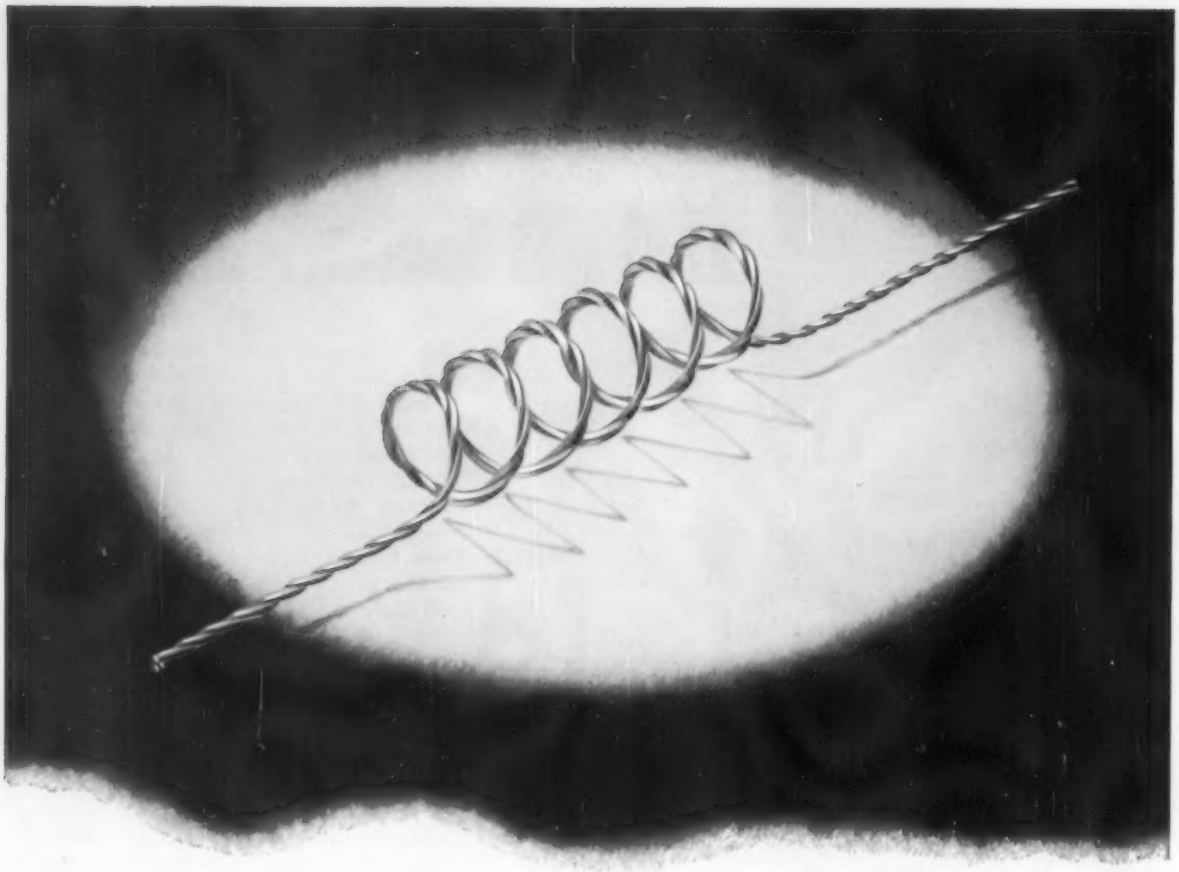
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• Allen-Bradley Company, Milwaukee, pioneer manufacturer of top-quality motor controls, makes more than 2000 different plastic parts for its products. Its molding department has used THERMEX Electronic Preheaters since 1946 and now has 28 units which work with each press on automatically controlled time cycle.

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This 3 KW THERMEX Unit heats preforms to 280°F in 30 seconds for molding relay bases—12 at a time. Complete preheating and molding cycle is 2.4 minutes.

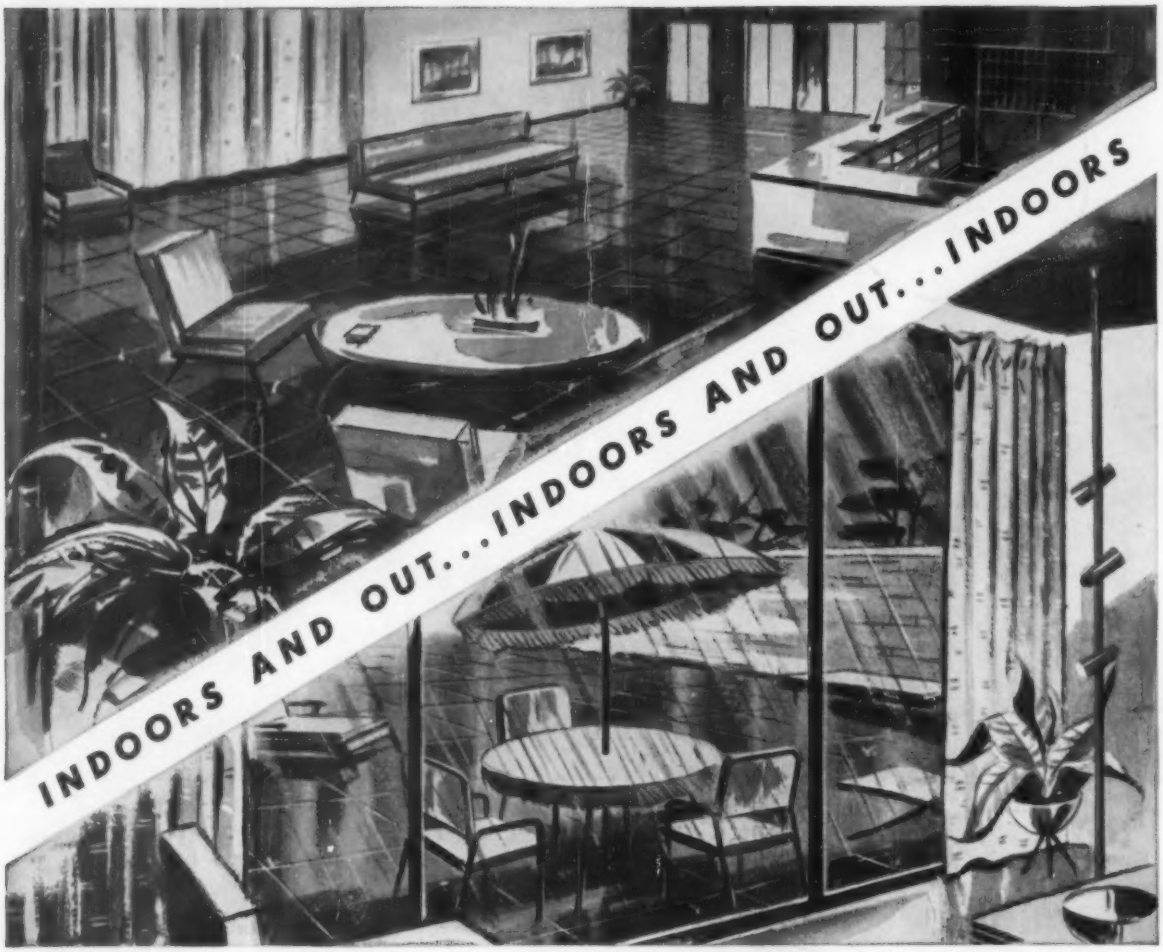
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MODERN PLASTICS

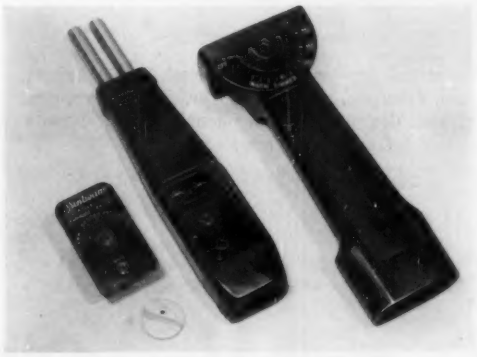
Volume 34
June 1957
Number 10

Look what's happened to handles!

Especially in home appliances, handles have become more than simply a means of lifting and moving

Plastics handles have been around for a good many years and, particularly in the thermosetting category, have long accounted for an important volume of molding material. But many of today's plastics handles are a far cry from those produced ten years ago—or even three or four years ago. New types of electrical appliances, for example, have not only dictated fresh design concepts for handles, but also have helped to stimulate the development of improved plastics materials and production techniques.

Today's plastics handles must still perform their primary purpose of providing secure and convenient means of lifting and moving. Over and above this, however, the handle must be of pleasing design which will add sales appeal to



Transfer molded phenolic handles for Sunbeam automatic frypan and saucepan (see below). Control knob (see left foreground) is molded of nylon. Calibrations are intaglio molded and then filled with white paint for good legibility. (Photos, Chicago Molded Products Corp.)

the product. It may also be offered in a choice of several colors, to match or harmonize with household color schemes.

Today's handles embody not only such proved handle materials as phenolic—which, incidentally, continues to hold top position for appliance handles requiring high heat resistance and electrical insulating properties—but also melamine, glass-reinforced polyester, and several types of thermoplastics.

The modern housewife accepts plastics handles without question for today's smartly styled irons, frying pans, cookware, toasters, coffee makers, waffle irons, rotisseries, food mixers, and many other types of appliances and household equipment. Plastics handles remain comfortable to the touch even when a cooking utensil is hot. They are also resistant to staining and to chemical attack, which from the housewife's standpoint is important because they will retain their original handsome appearance for years. Furthermore, their design freedom is such that they can be made in practically any desired shape.

Frying pan handle molded of phenolic for Quakermaid is cored at each end. Temperature scales are engraved on thin metal plate which is bonded to handle in shallow molded-in recess. (Photo, Norton Labs)



Manufacturers like them

The manufacturer, too, has good reasons for liking plastic handles. With the wide range of materials and fabricating methods now available, he can specify a plastic handle which will meet all production and service requirements. In some instances, he can keep handle costs to a minimum by using stock items for which molds are already in existence. When a special handle design is required, it can be engineered

Line of controlled-heat electrical appliances by National Presto Industries — including Dutch oven, saucepan, pressure cooker, frying pans, and grille — makes good use of well designed molded phenolic handles; units are operated by separate control (see photo, right)



Housing for control unit that fits appliances at left interchangeably is molded of phenolic material





Style, sturdiness, and good thermal insulating properties distinguish the well designed molded black phenolic handles that are used on Sunbeam automatic Coffeemaster



Modern toaster, produced in a variety of decorator colors, has contrasting lustrous ebony end plates and handles molded of phenolic material. (Photo, Westinghouse Corp.)



Base and handle of General Electric's Speed Kettle are molded of phenolic. Push button in handle operates spout cover

so that costs are minimized. Electrical components and threaded inserts can be molded in and painting and assembly eliminated.

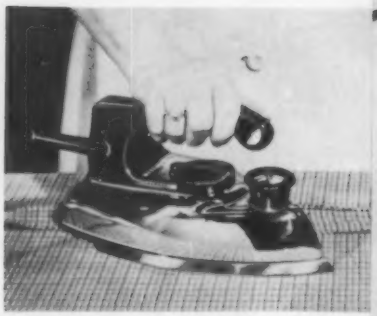
A major trend in small appliances today is the increasing use of handles which embody on and off switches, control dials, signal lights, and other features. Perhaps the best evidence of this trend is the growing number of automatic frying pans, saucepans, and pressure cookers. These units, which lend an entirely new dimension to meal preparation, have also opened up new concepts of design for molded plastic handles. Many of these handles house thermostatic control mechanisms as well as wiring, and hence must be elaborately cored.

By way of example

Sunbeam Corp., Chicago, Ill., which pioneered the new type of controlled heat cooking appliances with its automatic frypan, uses transfer molded general-purpose phenolic handles both for this utensil and for its new controlled-heat saucepan. (Photo p. 105.) The electrical elements are sealed so that the utensils can be completely immersed in water for convenient washing.

In both of these handles (photo p. 105), electrical contacts are secured by mounting plates. Both also have molded nylon pointer-type control knobs. The frypan pointer fits a concealed molded nylon pinion which actuates the thermostatic control mechanism. Nylon was specified for these parts because of its toughness, good electrical properties, and high heat resistance. Cooking guides on both handles are of the metal decal type. Temperature calibrations are intaglio molded and filled with white paint for legibility.

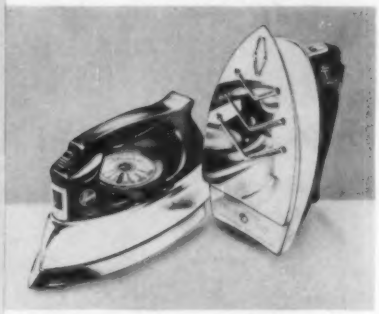
The saucepan handle is cored at the lower end for the control mechanism and attachment to the side of the pan. The frypan handle is molded with two metal tubes as inserts which



Open-ended iron handle is molded of phenolic in a rose-brown color. Control knob is mounted in handle base. (Photo, Westinghouse Corp.)



Exposed operating parts of iron (below) indicate the complex coring necessary to accommodate them in handle (above) molded of Durez phenolic by Martendell Molding Co.



Black phenolic handle for Hoover iron has molded-in thumb rests; also serves as support when iron is placed on its end

attach to the base of the pan. These tubes also carry the wires to the heating element embedded in the base of the pan and enclose a metal rod which links the heat-control dial to the thermostat.

Colors being investigated

To make the frypan handles available in a choice of attractive colors, in addition to the black currently used, Sunbeam is investigating the use of a new type of polyester molding compound produced by Durez Plastics Div., Hooker Electrochemical Co. This material, which like phenolic can be molded by either compression or transfer, has adequate heat resistance for applications of this type and can be had in a wide range of pastel colors as well as in white to dark.

Another approach to overcoming the color limitation of phenolics, now under consideration by appliance makers, is a newly developed coating based on epoxy resins. This coating—permanent, heat-resistant, chip-proof, and low in cost—was described in MODERN PLASTICS 34, 115 (May 1957).

A handle produced by Norton Laboratories, Inc., for the Quakermaid automatic electric skillet (photo p. 106) is transfer molded of Durez phenolic and cored at each end. One core is of the orthodox type; the other is a special retracting type, actuated by a knockout pin. This handle, including two electrical plugs molded in as inserts, weighs approximately 9 ounces. At the outer end of the handle, a small pointer-type knob follows a temperature scale. This scale, as well as the cooking scale showing heat settings and cooking times for various foods, is engraved on a thin metal plate which is cemented directly to the plastic. Shallow molded-in recesses keep the metal plate flush with the handle surface.

National Presto Industries, Inc., Eau Claire, Wis., manufactures a complete family of six new submersible automatic appliances—a Dutch oven, sauce pan, pressure cooker, two frypans, and a griddle—which are operated by means of the Presto Control Master (photo p. 106), a specially designed plug having its own built-in control dial. The handles of the appliances and the control unit housing are molded of general-purpose phenolic material; the control unit fits all appliances interchangeably.

General-purpose phenolic also holds sway as the favored handle material for toasters, coffee

makers, waffle irons, sandwich grills, and carafes. Black is the favorite color, although some manufacturers use dark brown mottles. In keeping with the trend toward more color in the kitchen, Westinghouse now offers its electric toasters (photo p. 107) in three colors plus white—lemon yellow, frosting pink, and mint aqua. In each instance, the colorful porcelain enamel finished housing of the toaster is set off by rich ebony phenolic end panels and handles.

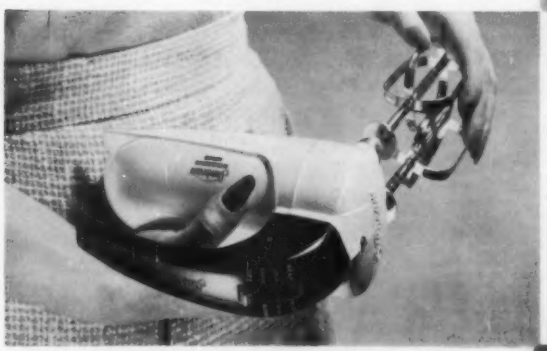
For its popular Coffeemaster automatic coffee maker, Sunbeam uses black phenolic handles molded of Bakelite general-purpose material by Chicago Molded Products Corp. The base and switch for this appliance (photo p. 107), are also molded of the same phenolic formulation. The smartly styled handle of General Electric's Speed Kettle (photo p. 107), with a pushbutton control for the flip-up type spout closure, is molded of GE's Textolite phenolic material. The same type material is also used in the molded stand for this appliance.

Virtual revolution

The story of how molded plastics virtually revolutionized the design and production of handles for irons is an excellent case history of how plastics pioneering paid off. (See also "Bigger handles—better irons," MODERN PLASTICS *31*, 180, June 1954.) The first plastic iron handles, introduced late in the 1920's, were merely phenolic cross bars, mounted between metal uprights. By contrast, the general-purpose or mineral-filled phenolic handles used on today's irons are marvels of functional design. Most modern iron handles are one-piece units



Hoover Pixie portable vacuum cleaner incorporates black phenolic handle which also serves as anchor for shoulder strap



Streamlined handle for Sunbeam Mixmaster Hand Mixer is molded of black cellulose acetate by Chicago Molded Products Corp.; handle doubles as convenient heel rest. (Photo, Eastman Chemical Products, Inc.)



"Comfort-Angle" handle and upper housing for Waring RM-2 Mixor are molded of acetate by Watertown Mfg. Co. (Photo, Eastman Chemical Products, Inc.)

complete with hand grip, end supports, and base plate.

Whereas early iron handles contained only 3 or 4 oz. of plastic material, modern handles may weigh from 7 to 12 ounces. Embodying control dials, on-off switches, thumb rests and waterfill apertures (for steam models), today's iron handles have done much to lighten the modern housewife's laundry chores. In production, extensive internal coring of the handles not only permits faster cures by holding wall sections to a desirable minimum, but also makes the handles cooler in use because of large air spaces. It is a safe bet that more design ingenuity has been exercised on iron handles during the past few years than on handles for any other type of appliance.

Photographs on p. 108 illustrate typical design treatments of phenolic iron handles. The Westinghouse Open Handle Steam-N-Dry iron has a molded phenolic handle of rose-brown color. Mounted in the base plate of the handle is a "touch-click" control dial with eight settings for ironing different fabrics. The Hoover iron has a handle of the completely enclosed type with either partial or full base plate and control dial located below the handle grip. A water fill opening is cored in the front section. The Proctor iron also has a handle of the enclosed type but with the control knob at the extreme front end of the handle. The photograph of the "bare" operating parts of the iron show how intricate must be the coring of the handle to accommodate them. The handle for the Proctor unit is molded of black Durez phenolic material by Martendell Molding Co., Trenton, N.J.

Food mixers

In handles for food mixers—standard as well as "junior" or portable type—both thermosetting and thermoplastic materials are currently used. The trend seems to be to thermoplastics, not only for the handles themselves but also for the complete mixer housing. The growing emphasis on color as a merchandising tool for appliances has had a great deal to do with this development. Also, thermoplastics are acceptable for handles on such appliances because there is no severe temperature problem and electrical insulating characteristics of selected thermoplastics are adequate. In addition, their toughness permits them to meet the normal amount of banging around (and possible dropping) without damage. For example, (*To page* 276)



Lightweight handle of waxer is extruded of butyrate; fittings at each end are molded of butyrate and polyethylene. (Photo, Eastman Chemical Products, Inc.)



Non-professional paint spray gun has handle and head molded in one piece of black nylon (see inset for close-up). Molded-in hook at top permits hanging for convenient storage. Below is compressor that supplies air to gun. (Photos, Chicago Molded Products)

Plastics fly high in the BIG BALLOONS

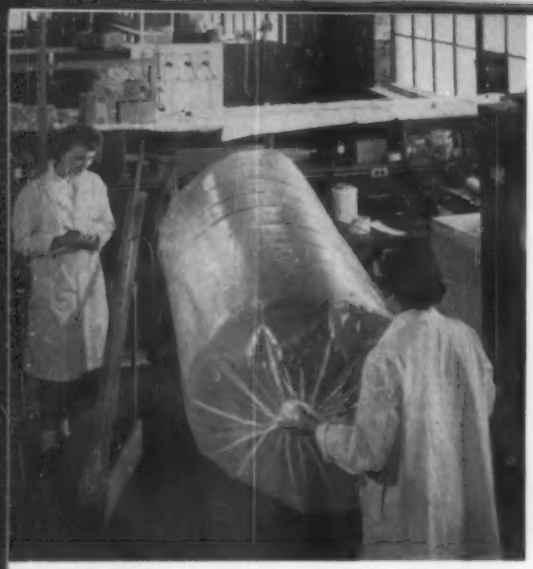
Several months ago a balloon made of plastic film, carrying a 48-lb. load of scientific instruments, soared to a height of approximately 27 miles, eclipsing all records for balloon flight. Shortly thereafter, another plastic film balloon carried two U. S. Navy officers in a sealed metal gondola to 76,000 ft.—the loftiest height attained by a man-carrying balloon.

These are two of the more dramatic highlights in the new age of plastic balloons. For some time, smaller balloons have been carrying freedom propaganda into the satellite countries of Europe. Currently, still other types of plastics balloons are being widely used in various phases of weather investigation. All of these developments are the outgrowth of an entirely new concept of balloon construction, based on the use of very strong, thin plastics film to replace rubberized fabric and other relatively heavy materials. The two plastics films most important in this lofty revolution are polyethylene and (more recently) Mylar polyester.

Light weight is probably the greatest advan-



Fabricated of heat-welded sections of polyethylene film, balloon flies fully inflated at an altitude of 100,000 feet. Photo was taken from ground, using an astronomical telescope. (Photo, Winzen Research, Inc.)



Polyethylene film material, 0.001 in. thick, for use in balloon envelope, is tested for ability to withstand specified pressures. Film weighs less than 1 oz./sq. yd. (Photo, General Mills, Inc.)

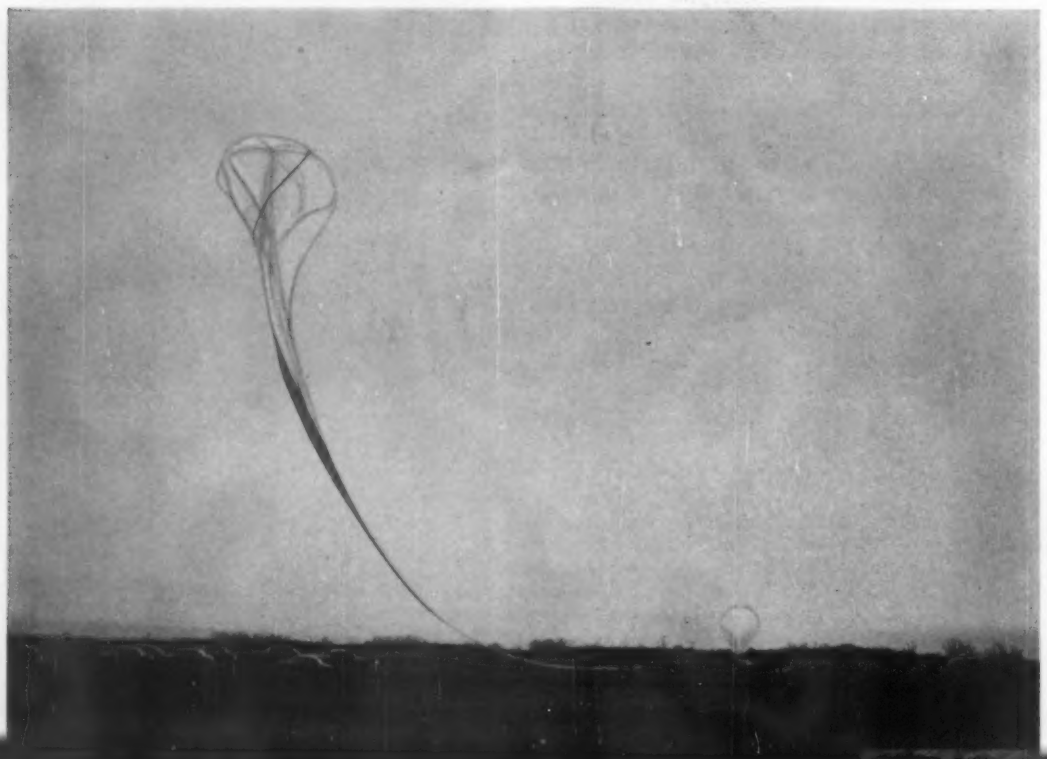


Production set-up for the fabrication of polyethylene balloons. Film is laid out on long work tables, cut to proper pattern, and sections are sealed together into finished envelopes—one of which is shown being folded for shipment. (Photo, General Mills, Inc.)

tage which plastics films bring to balloons. For example, the rubberized fabric envelope of the 3,700,000-cu. ft. Explorer II, which in the mid-30's carried Capts. A. W. Stevens and O. S. Anderson to 72,394 ft., tipped the scales at 6500 pounds. The envelope of the Super Skyhook I, a polyethylene film balloon of 3,200,000 cu. ft. capacity, weighed only 850 pounds. In 1954 it set a new record of 117,000 ft. for unmanned balloons.

There is also the matter of lower material and fabrication costs. Since plastics films can be used in very thin gages—even as low as 0.00025 in.—the plastics balloons are less expensive.

Helium-filled polyethylene Skyhook is launched. Small balloon at right helps lift trailing instrument lines, prevents damage to instruments during take-off. (Photo, General Mills)

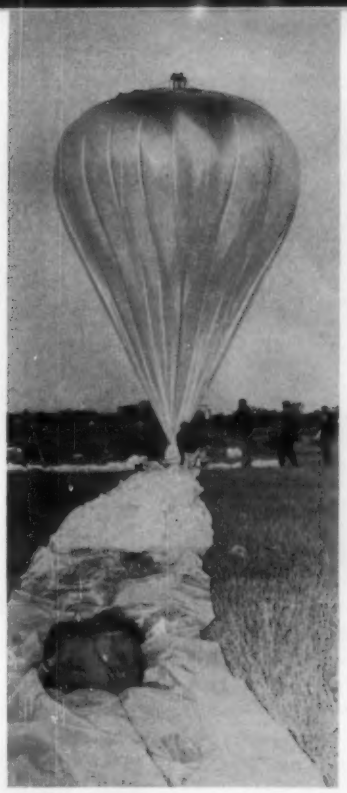


This makes it economically practicable to produce very large balloons having sufficient gas capacity to reach heights of 100,000 ft. or more. Thin polyethylene sheeting costs about 4¢/sq. yd.; rubberized balloon cloth about $2. Furthermore, the plastic film can be heat-sealed with semi-automatic equipment; rubberized cotton requires laborious cementing.

Since 1947, the Mechanical Div. of General Mills, Inc., Minneapolis, Minn., has pioneered in producing and flying polyethylene film balloons under an Office of Naval Research feasibility study called Project Helios. Other companies actively engaged in building and flying plastics film balloons include Winzen Research, Inc., Minneapolis; G. T. Schjeldahl Co., Northfield, Minn.; and Raven Industries, Inc., Sioux Falls, S. D.

Many materials studied

After extensive testing of various possible materials, including cellophane, nylon, ethyl cellulose, Pliofilm, and saran, General Mills turned to polyethylene film as the most desirable. Tests showed that it holds gas well, maintains strength and flexibility even at temperatures far below zero, and is chemically stable. It produces little superheat by the absorption



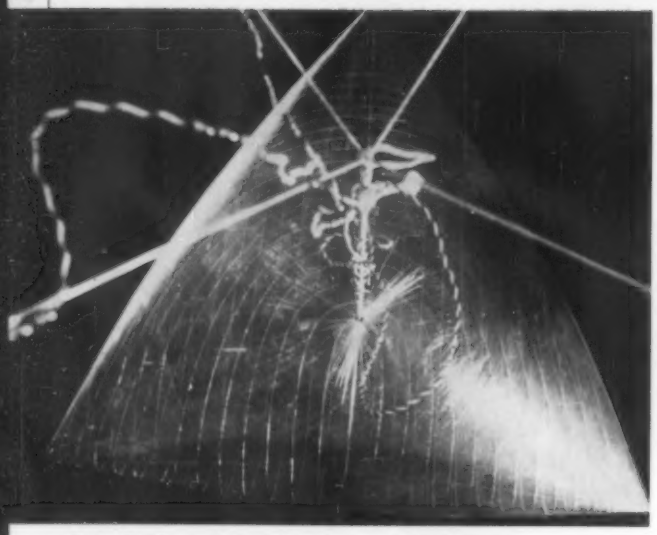
Research balloon carries spectrograph mounted on a spike on crown of envelope

Reinforced plastics gondola used by Navy researchers to make ascent with polyethylene balloon. (Photo, General Mills, Inc.)

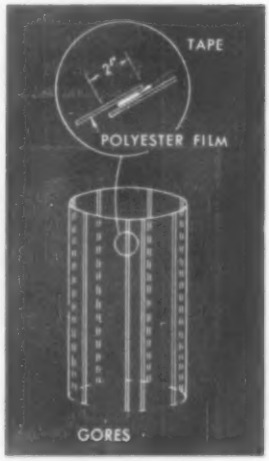




Small auxiliary balloon is used to hold instrument up at start of gas-filling operation. (Photos, Raven Industries, Inc.)



Tetrahedron-shaped balloon, fabricated of Mylar polyester film. Viewed from the gondola below (note shroud ilnes), it looks like a triangle. (Photo, Du Pont)



Sealing joints of Mylar balloon: special tape is laid between overlapping margin of sheets of film and seal made with conventional heated-wheel sealer. (Sketch, Schjeldahl)

of radiation and has adequate tensile strength and tear resistance to withstand the loads normally encountered.

In fabricating the balloons, huge amounts of polyethylene film ranging from 0.0005 to 0.0025 in. in thickness are cut to proper size and shape and assembled. The largest General Mills balloon, the Super Skyhook, is 282 ft. long and incorporates approximately three acres of film. Using work tables 240 to 300 ft. long, the gores or balloon sections are cut to size by means of a movable cutting edge and large templets. In one operation, twice as many thicknesses of polyethylene are cut as there are gores in a balloon. A "hot jet" sealing process, in which heated air is forced through a nozzle, is used in heat-sealing the film sections together. Over these seams, on many of the balloons, is heat sealed special glass filament-reinforced polyethylene tape. This tape, which protects the seams and helps bear the weight of the balloon's load, has a tensile strength of 120 lb. per inch of width.

In addition to the load tapes, Scotch brand polyethylene film tape No. 480 is used in securing the breather and inflation tubes of the balloons; filament tape, having a tensile strength of 500 lb. per inch of width, reinforces some portions of the balloons. During construction stages, General Mills uses acetate fiber tape (Scotch brand No. 750) to hold portions of the balloon together until heat sealed.

The finished plastic envelope is subjected to a variety of punishing conditions as it soars upward toward the stratosphere. On one flight from the Galapagos Islands, a temperature of −85° C. was encountered. The bag must also withstand flutter caused by rapid ascent or atmospheric turbulence, exposure to intense solar rays, effects of ozone, bombardment by cosmic rays and exposure to other as yet unknown stratospheric phenomena.

Mission research

Except for the so-called freedom balloons, whose function is to carry printed material into Iron Curtain countries and release it at the proper time, most plastics balloons being used today are sent aloft on research missions. The Navy, for example, has been using helium-filled polyethylene balloons 39 ft. in diameter to study winds, temperatures, air pressures, and other weather conditions high above the Pacific Ocean. Launched from Japan, these balloons carry an array of meteorological instruments and a 50-w. battery-powered radio transmitter that can be monitored and tracked by ground stations. Regulated by automatic ballast devices, they ride the prevailing westerly winds at a 30,000-ft. altitude. One such craft made the trip from Japan to a point near Jackson, Miss. (a distance that is roughly 10,000 miles) in three days, reaching a maximum speed of 200 m.p.h. when pushed by the high altitude jet stream.

Cosmic ray studies at high altitudes have been made possible through the use of plastics film balloons. When these rays strike the earth's atmosphere, the primary particles become ionized, converting them into secondary cosmic rays.

However, high-altitude balloons bearing the necessary recording instruments (*To page* 281)

Double extrusion-coating

Metal pipe is protected by polyethylene and vinyl by new Italian process using adhesive applied prior to extrusion

Recent addition of new pre-extrusion techniques has brought further advantages to the L.M.P. process of extrusion-coating iron and steel pipe with two layers of two different kinds of plastics—polyethylene and vinyl. The basic technique was briefly described in MODERN PLASTICS *33,* 91 (July, 1956).

An exclusive right to the process for Italy has been granted to Dalmine S.p.A., one of the leading manufacturers of cast iron pipes in Europe, and Dalmine has developed a special process to assure perfect adherence of the plastic sheath to the pipe. This consists of placing on the pipe a layer of adhesive which will prevent the loosening of the sheath in case of accidental rupture.

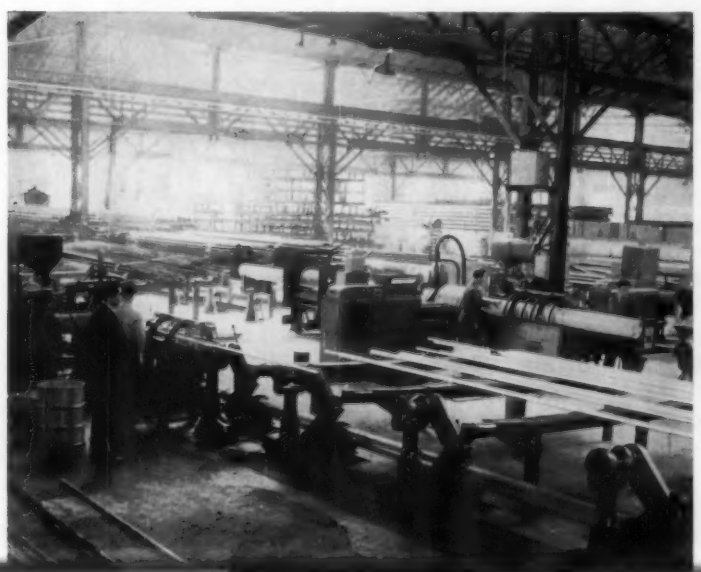
The pipe to be jacketed goes through a tubular oven and then passes under a stream of adhesive which is kept continuously in circulation. Excess adhesive falls back into the tank. From the tank the pipe passes through smoothing rings which take off further excess adhesive and spreads the remaining adhesive evenly. Then the pipe passes through a crosshead die which is simultaneouly fed by two extrusion machines, one of which extrudes a coating of polyethylene and the other a polyvinyl chloride compound on top of the polyethylene coating.

The completed jacketing adheres so tightly to the pipe that it is almost impossible to detach it; in the case of rupture of the plastic sheath, there is no infiltration of liquid between sheath and pipe.

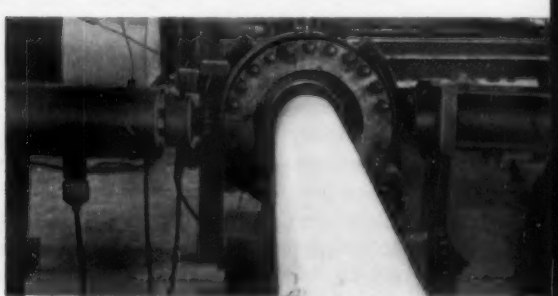
The two plastics serve two different purposes. The polyethylene provides thermal insulation and resistance to acids, alkalis, and electrolytic action; the vinyl layer provides impact and abrasion resistance; the adhesive compensates for the difference between the thermal expansion and contraction of the metal and the plastics coatings and also compensates for imperfections that are found in the surface of the metal pipe.

In pipeline laying it is necessary to cut the two covering layers at the end of each pipe length, weld the metal ends together and, using polyethylene and vinyl tapes with adhesive, produce a spiral covering of the joint.

The process, a combined development of Lavorazione Materie Plastiche and Dalmine S.p.A., is being widely used in Italy and is creating considerable interest elsewhere.



Over-all view of production set-up for the double extrusion-coating of metal pipe of various lengths and diameters. (Photos, Lavorazione Materie Plastiche)



Close-up of pipe emerging from a crosshead die, coated with a layer of polyethylene and a layer of vinyl

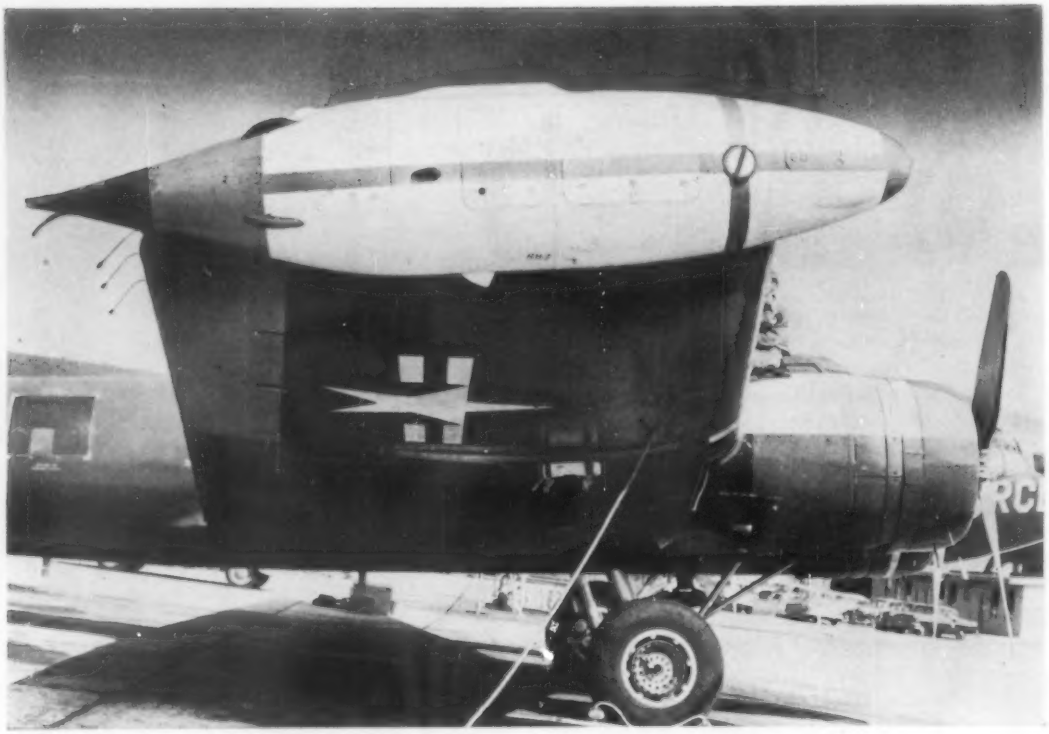


Fig. 1: Drone aircraft with detachable wing-tip pods. Pods contain photographic equipment protected against impact and sinking by buoyant plastics foams

To drop and float

Two types of plastics foam are being used to protect photographic equipment used in the evaluation of guided missiles

*By W. L. Mackie**

Multicellular plastics are being used to protect airborne photographic instrumentation containers from shock and to impart buoyancy when they are jettisoned over water.

One phase of the flight evaluation of guided missiles consists of launching the missiles against targets flown over a sea test range. The targets are drone aircraft equipped with two detachable wing-tip pods, containing automatic parachutes (Fig. 1). Remotely controlled data-recording cameras installed in the pods photograph the space surrounding the target and record missile flights which enter this space. The exposed film is used for evaluation of the miss vector. In case of emergency, the camera pods are jettisoned and recovered by boats.

Obviously, buoyancy and resistance to the shock of water entry are of considerable importance to insure successful salvage of the film record. These requirements have resulted in the choice of multi-cellular plastics to provide maximum buoyancy to the pods and to cushion the photographic equipment against the shock of water entry.

One type (Fig. 2), is a reinforced cylindrical

*U. S. Naval Air Missile Test Center, Point Mugu, Calif.

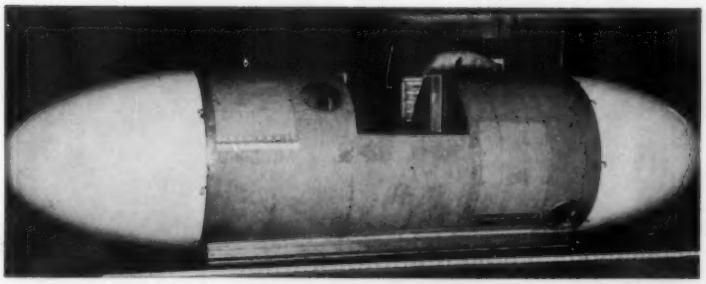


Fig. 2: Reinforced plastics nose and tail cones are filled with thermoplastic, foamed in place around wooden camera mold. (See Figs. 4, 5, 6, next page)

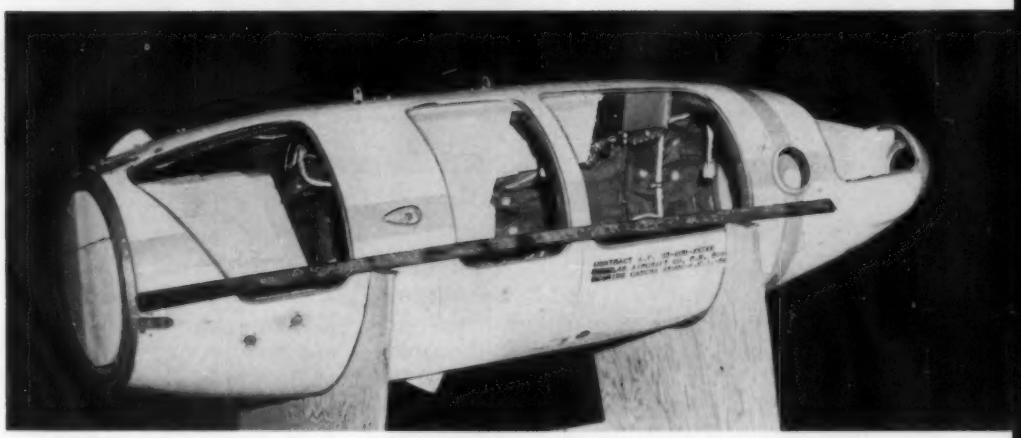


Fig. 3: Interior of pod is filled with slabs of Styrofoam expanded polystyrene, cut to size on templates and adhered to inside surfaces

metal shell with fibrous glass laminate nose and tail cones. Recording cameras are mounted in the cones. The other type (Fig. 3), is considerably larger and is not equipped with plastic cones. Each of these containers was insufficiently leak resistant to remain afloat for the required length of time in the open sea.

Specifications

Specifications for the pods include the ability to withstand the shock of water entry upon being repeatedly dropped into the sea from drone aircraft, and adequate buoyancy to remain afloat for eight hours. This latter requirement is of considerable importance, since the pod containing photographic instrumentation and the film record of the operation might not be salvaged for several hours. Also, the entire pod apparatus must function properly under temperatures between —65 and 100° F., altitudes between sea level and 30,000 ft., and transient accelerations up to 6g in any direction. Finally, the filler material must have excellent resistance to moisture and fungi and be easy to install.

A foamed-in-place, rigid, thermosetting plastic was chosen to impart strength and rigidity to the fibrous glass laminate nose and tail cones on the smaller of the two pods. The unique ability of this plastic to be foamed in place with exceptional ease without the need for complicated processing equipment, proved ideal for this application. It is a simple procedure to make wooden molds of the cameras, accurately position the molds within the cones and fill the intervening spaces with the foamed-in-place plastic. This provides an excellent structural reinforcement to cushion shock during water entry and thus protect the cameras against damage as well as to supply the needed buoyancy. Figures 4, 5, and 6 show, respectively, the camera mold, nose cone with foamed-in-place plastic, and the completed camera cavity. The foamed-in-place material was supplied by American Latex Products Corp., Los Angeles.

The enclosed spaces in the larger pod were not suitable for use of a foamed-in-place type of filler material. Therefore a material with similar properties was sought which could be purchased in the expanded condition, cut to



Fig. 4: Wooden form for production of camera cavity

Fig. 5: Nose cone with plastic foamed around camera mold





Fig. 6: Foam-filled cone; camera will fit into cavity

size, and securely cemented to the inside surfaces of the pod. It was found in Dow Chemical Co.'s Styrofoam expanded polystyrene. Approximately 5 cu. ft. of this material, weighing only 10 lb., can be conveniently installed in the pod without interfering with the operation of instrumentation or with regular servicing operations such as loading and unloading the film magazines.

Simple metal templates were made and the foamed plastic blocks cut to size on a band saw. The shaped pieces are cemented to the inside metal surface of the pod with a rubber-resin base adhesive made by Miracle Adhesives Corp. The metal is cleaned prior to bonding and then brush coated with adhesive. The blocks of foam are also coated with adhesive and then set in position. All exposed surfaces of Styrofoam are finally coated with adhesive to prevent flaking-off during servicing operations. Figure 3 shows pod with the Styrofoam blocks installed and Fig. 7 shows installation of Styrofoam around data-recording camera.

Without the protection afforded by foamed plastics, the life of the pods in the open ocean would be brief indeed, since damage to the shell of the pod upon striking the water would result in leakage and sinking.

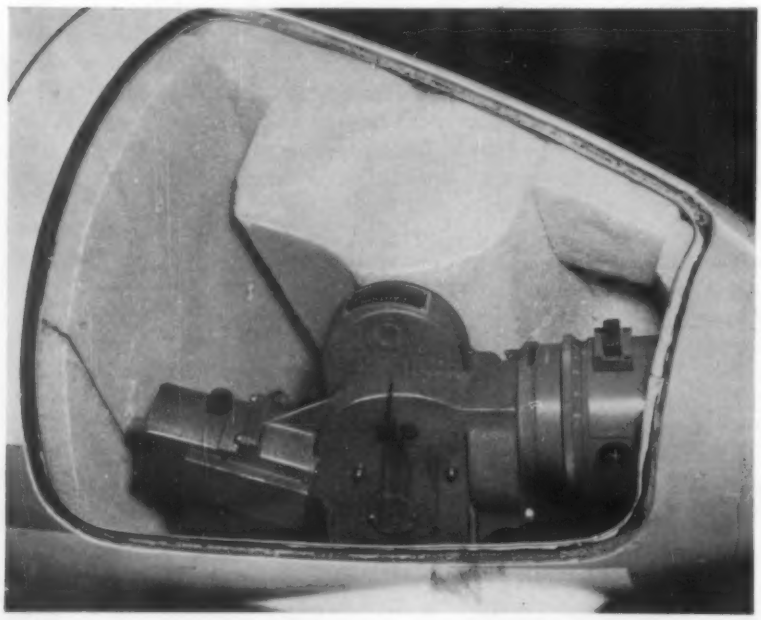


Fig. 7: Close-up of data-recording camera, surrounded by Styrofoam, installed in nose section of pod. (Photos, Official U. S. Navy Photographs)



Inflated vinyl boat, 8 ft. long and powered by outboard motor, is practically unsinkable; while only one man is shown, boat can carry two passengers comfortably

Two-man vinyl boat

Eight-foot inflatable craft for use with outboard motor is made of 18 yards of laminated vinyl sheeting

An inflatable vinyl boat capable of carrying two men comfortably and designed for use with an outboard motor has been introduced by Davis Products Inc., Santa Monica, Calif. Tested in rough Pacific waters, the craft has proved able to cope with the most rugged demands of water sportsmen.

The boat is made of 18 yd. of 22-gage laminated vinyl sheet and is so constructed that within a 15-in. diameter outer tube there is suspended a separately inflated 8-in. diameter inner tube. Because of the spacing between these two tubes, it is almost impossible for any object to puncture both tubes at one time. Should the outer tube be punctured, the inner tube will still float a weight of over 500 pounds.

Equipped with a separately attached combination wooden seat and motor attachment, the sturdy little boat can be powered by any standard outboard motor up to three horsepower.

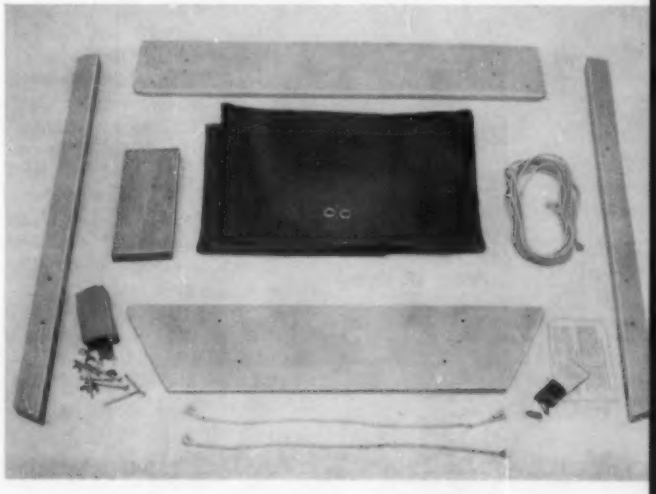
Deflated, the boat weighs 12 lb.; the outboard and seat attachment weighs 13 pounds. Inflated dimensions are 8 ft. by 4½ ft. by 15 in. deep.

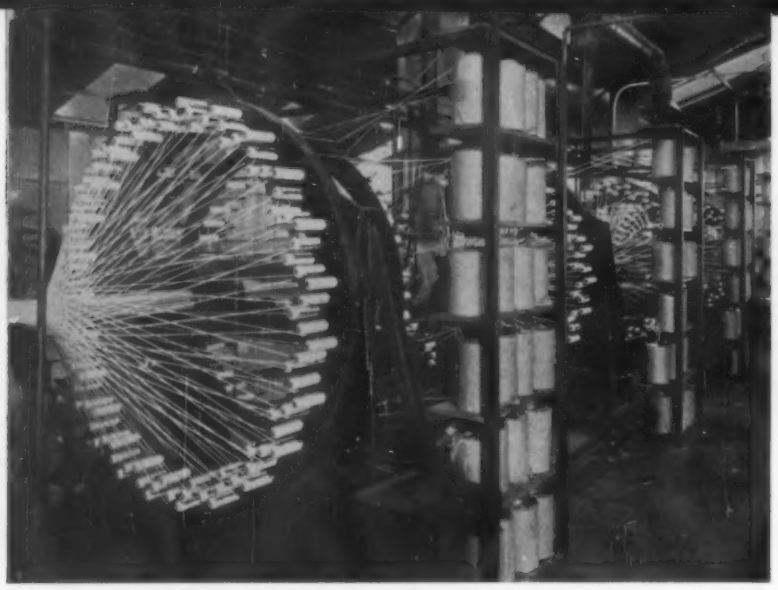
Credit: Boltaflex vinyl sheet by The General Tire & Rubber Co.'s Pennsylvania Plastics Div.



Boat is fabricated by electronic sealing of 22-gage laminated vinyl; 18 yd. are required per boat. (Photos, Davis Products)

Parts of complete boat: wooden seat and motor mounting frame, inflatable vinyl tubing, lifeline, hardware, patching kit





Production set-up used in the manufacture of reinforced plastics pipe by a mandrel wrapping process. Fibrous glass reinforcement is wound over mandrel to form braided sleeve. (Photo, The Fibercast Corp.)

A critical look at

Reinforced plastics pipe

Tremendous potential will materialize only if new production methods are found and higher standards set and met

*By James W. Case**

Why are not standard sizes of glass reinforced plastics pipe available on the market so that the user can select appropriate grades, cut them into suitable lengths, and connect them for various jobs as is done with metal pipe? Is there a need for such a standardized product for industrial and domestic use? What advances in engineering are necessary to bring it into being? These are questions which inevitably arise when the known advantages of glass reinforced plastics pipe are contrasted with its availability.

In an endeavor to find answers to these questions, it might be well to examine the engineering development that has led to present methods of making glass-plastic pipe, as well as the present state of the art.

Engineering development

The development of present reinforced pipe forming methods might be traced to processes for making wound paper tubes as, for example,



James W. Case

The Author

JAMES W. CASE was born in Missouri in 1898 and grew up on farms in Missouri and Nebraska. He graduated from the University of Missouri in 1923 and worked for General Electric Co. at Schenectady, N.Y., from 1923 to 1941 as an electrical engineer. Mr. Case then took a position as ordnance engineer with the Navy Bureau of Ordnance in 1941, serving as underwater ordnance specialist during World War II. He helped to develop "mothballing" methods for Reserve Fleet ordnance, then got into materials research, principally in the fields of fibrous reinforced glass and plastics. He has actively participated in Government Forum at S.P.I. annual conferences since 1954.

*Research & Development Div., Navy Bureau of Ordnance

shown by White (1).[1] A cylindrical mandrel was used as the form. When plastics resins came along, they were used as impregnants for the paper, making stronger tubes. Then, Stephens (2) and Francis (3) proposed methods of forming resin impregnated glass reinforced pipe by essentially two variations of the mandrel wrapping process. Since that time, mechanical forming processes have undergone very little basic change.

Present pipe forming methods can be divided into two broad classes:

1) Mandrel Wrapping. This process employs a mandrel on the outside of which is wound the resin impregnated fibrous glass reinforce-

[1]Numbers in parentheses link to references on p. 292.

Table I: *Glass-reinforced plastics pipe producers*

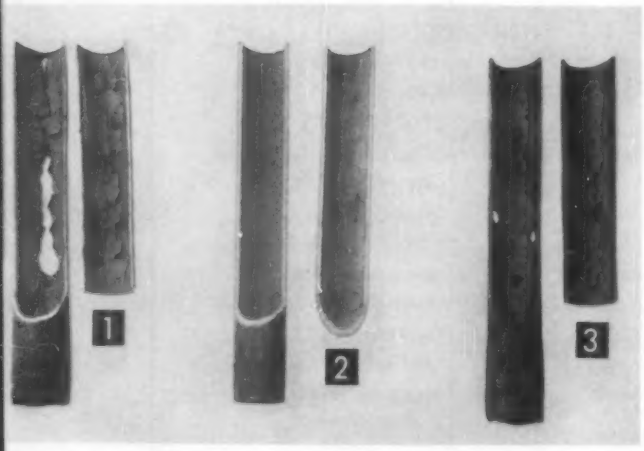
Application	Diameter in.	Reinforcement	Method of manufacture[a]	Availability[b]	Manufacturer
Water, oil, chemical	2⅜ and 4	Glass roving	P.M.	P.P.	Food Machinery & Chemical Corp., New York, N.Y.
Not decided	¾ to 20	Not stated	M.W.	D	A. O. Smith Corp., Los Angeles, Calif.
Industrial, corrosion	4,6,8,10, and 12 O.D.	Not stated	C.C.	Pr.	Reflin Co. San Diego, Calif.
Various	2½ I.D. and up	Fiberglas cloth	M.W.	Pr.	Universal Molded Products Corp., Bristol, Va.
Chemical and oil field	2,3,4, and 5 I.D.	Glass roving	M.W.	Pr.	Spiral-Glas Pipe Co., New Brunswick, N.J.
Industrial	1/16 I.D. to 5 O.D.	Woven fiberglas	M.W.	Pr.	Lamtex Industries, Inc., Westbury, N.Y.
Line pipe and well tubing	2⅜, 2⅞, 3½ O.D.	Braided glass sleeve	C.C.	Pr.	The Fibercast Corp., Sand Springs, Okla.
Salt water, crude oil	2	Continuous glass filaments (Thermoplastic lining)	M.W.	Pr.	Minnesota Mining & Mfg. Co., St. Paul, Minn.
—	—	—	M.W.	P.P.	Amercoat Corp.[c] S. Gate, Calif.
—	—	Glass roving	C.C.	P.P.	Apex Electrical and Mfg. Co[c]., Cleveland, Ohio
—	—	—	H.L.	Pr.	The Chemical Corporation[c] Springfield, Mass.
Military	—	Glass roving	M.W.	D	M. W. Kelogg Corp.,[c] Jersey City, N.J.
Military	—	Glass roving	M.W.	D	Young Development Labs.,[c] Princeton, N.J.
—	—	—		D	Haveg Corp.,[c] Wilmington, Del.
Low pressure ducting, etc.	Up to 43	Glass fabric	M.W.	P.P.	Lunn Laminates, Inc., Huntington Station, N.Y.
Industrial, military		Continuous glass filaments	M.W.	D	Designs, Inc., Washington, D.C.

[a]P.M. = pressure molded, M.W. = mandrel wrapping, C.C. = centrifugal casting.
[b]P.P. = pilot plant, D = development, Pr. = production
[c]From unconfirmed information

Table II: Tensile properties of glass-resin laminates

Specimen	Type lay-up	Glass	Ultimate strength (laminate)	Ultimate strength (glass)
		%	p.s.i.	p.s.i.
1. Boat hull[a]	Wet	33	15,600	54,000
2. #181 cloth[b]	Wet	60	40,000	90,000
3. #1000 cloth[c]	Wet	54	33,000	91,000
4. #143 cloth (parallel)[c]	"	63	78,500	150,000
5. Parallel fiber mat[d]	"	60	92,000	222,000
6. Parallel roving[e]	"	70	130,000	240,000
7. Parallel fiber mat[f]	Prepreg	80	216,000	332,000

Sources of data:
[a]Graner and Alfers, "A Progress Report on Bureau of Ships Activities in Reinforced Plastics" S.P.I. Proc. 1954, Sec. 1G.
[b]Specification MIL-P-8013
[c]Navord 2669 (NOL Report on Forest Products Tests).
[d]Reported under Contract NOrd-13462.
[e]Lunn, James R., "Reinforced Plastics, New Engineering Challenge," American Engineer, Jan. '56.
[f]Reported under Contract NOrd-16101.



Effect of salt-water service on several types of pipe: 1—Cement-lined steel pipe failed after 14 months in salt water well; 2—reinforced plastics pipe after 2 years in same well; 3—plastic-coated steel pipe after 9 months. (Photo, Fibercast)

ment. Variations include the use of a steel mandrel that may be heated or not; a copolymer mandrel that may form a part of the ultimate pipe; various forms of reinforcement such as glass cloth, roving, or tape; and a wide variety of fibrous glass feeds, impregnating methods, and resin curing arrangements. Use of this process indicates that it may give the fabricator the greatest amount of freedom in the control of the glass pattern to suit specific applications. For example, a pipe that, in service, will have unrestrained ends and be subjected to internal pressure must have about twice as much "hoop" strength as "beam" strength. The fabricator provides for this demand by winding the glass fibers at approximately 54° to the axis of the mandrel. Where very little beam strength is needed, the fibers are laid at 90° to the mandrel axis. Similar control of pipe wall strength may be attained by using glass cloth having various ratios of warp and fill fibers.

2) Centrifugal Casting. This process employs a rotating tubular mold into which fibrous glass and resin are fed, formed by centrifugal force, and cured by heat. While the glass in some cases may be chopped fiber, mat, or cloth, one manufacturer reports that better pipe properties can be obtained by use of a pre-braided glass sleeve. This process is described (4) as follows: "As the mold is spun at high speed, the glass fiber sleeve is forced against the sides of the mold. Epoxy resin is injected into the mold to coat the fiber sleeve and form a glass-like piece of rigid pipe around the strength-giving fibers. Heat provided by hot oil in the jacket around the mold cures the resin."

Markets for pipe

With this brief outline as a background, the potential market can be examined and its availability reflected in terms of active producers.

The great potential of this pipe in solving the big replacement problem of steel pipe in corrosive areas of the oil fields is shown by reference (5). The early interest (1951) of the oil industry in plastics pipe is indicated by the following quotation from that article:

"Recently, plastic tubing was given a field trial in a salt water disposal well under normal operating conditions. After being in the well one week, the 3210-ft. string of plastic tubing was pulled and it was found that 33 joints were

collapsed due to external pressure of approximately 315 p.s.i. Measured stretch in the string of 67 feet indicated present lack of creep resistance in this material." That was in 1951. Today, at least one manufacturer has overcome the many problems first encountered with reinforced plastics pipe and is now producing pipe for oil field use.

The S.P.I. has recognized the importance of plastics pipe in the industrial field as shown by the activities of its Pipe Standards Sub-Committee (6). Here is an ambitious attempt to set standards for a product that is thus far being made by a number of manufacturers in relatively small quantities.

The high interest of the electrical power industry in reinforced plastics pipe as a replacement for steel pipe for pressurized conduit of underground high voltage transmission lines is indicated by Kellam (7). In one paragraph he says: "The total length of such lines in the U. S. since their introduction in 1932 is about 400 miles, which exceeds the total mileage of low pressure (Pirelli) pipe-type cable introduced in 1927, both being underground systems. Ontario Hydro has some six miles of high pressure pipe line in use compared with 15,700 circuit miles of high voltage tower line. With the rapid expansion of the system and the merging of urban and suburban areas, it is expected that our use of underground lines will increase."

Some of the most valuable comment on the future of reinforced plastics pipe is given by Stein (8). Portions of his article that are pertinent to the market are quoted below:

"Recent market analyses indicate that by 1960 plastics pipe will be the largest single end use for plastics materials. This, of course, includes thermoplastic pipe which will command a share of the total volume, but the part allocated to reinforced plastics is not small—and is constantly growing. Better test methods and more realistic use specifications are limiting the areas in which present day thermoplastics can be used, thereby strengthening the position of reinforced pipe and tubing.

"Market analyses show possible uses for plastics pipe in the following classifications: 1) Aircraft ducting. 2) Conduit (electrical). 3) Gas transmission lines. 4) Industrial piping. 5) Irrigation. 6) Military: containers, missiles, ships. 7) Oil fields and oil production. 8) Water transmission.

"Based on the estimates made on one of the eight previously listed market possibilities, oil field uses, the production figures by 1960 could be astronomical. The oil fields are not the largest user (or potential user), yet they consume 60 million feet of pipe per year. Projected estimates show that it is probable that more than 400 million feet of reinforced pipe will be used per year by 1960 if technology advances as expected. Assuming only partial success, consumption will be nearer 200 million pounds of resin per year than the previous 8 million pound estimate; and at least (*To page* 285)

Table III: Properties of glass-reinforced plastics pipe

Type	*Type lay-up*	*Glass*	*Burst[f] pressure*	*Hoop stress[f] (avg)*	*Hoop stress[f] (glass)*
		%	p.s.i.	p.s.i.	p.s.i.
Centrifugally cast[a]	Wet	28.3	1800	10,100	28,000
Centrifugally cast[b]	"	60		32,400	70,500
#181 cloth, mandrel wrap[c]	"	54.8	2200	26,000	61,000
#181 cloth, mandrel wrap[c]	"	62.3	2500	28,800	58,000
#181 cloth, mandrel wrap[c]	"	49.6	1850	13,900	60,000
Filament wound[c]	"	70.0	3400	62,000	113,000
Parallel fiber mat,[d] mandrel wrap	"	44.6	4350	36,700	120,000
Parallel fiber mat,[d] mandrel wrap	"	43.2	2320	37,500	130,000
Tape wound, Resin "A"[e]	Prepreg	17	2850	41,000	387,000
Tape wound, Resin "B"[e]	"	32	4200	105,000	520,000
Tape wound, Resin "B"[e]	"	32	1800	96,000	508,000

Sources of data:
[a]Test on Perrault Bros. Pipe by Naval Ordnance Laboratory in 1951.
[b]Fibercast Corp., Sand Springs, Okla.
[c]Other Tests by Naval Ordnance Laboratory.
[d]Reported under Contract NOrd-14703.
[e]Designs Inc., 5200 River Rd., N.W., Washington, D. C.
[f]All burst pressures are based on short time tests. Hoop stresses calculated from

$$S = \frac{Pd}{2t}$$



Research center for Monsanto's Inorganic Chemicals Div. has an almost 100% plastics exterior; numerous plastics applications are used on the inside as well

The proof is in the using

Large producer of plastics has incorporated 80 different applications of materials in the construction of a new research center

The company went just as far as it could go with plastics in the construction of the new research center for Monsanto's Inorganic Chemicals Div. in St. Louis, Mo. The unique structure has a framework of steel girders but contains little else that's not plastic.

Inside and out, there are 80 different applications of plastics in the three-story building. Some of them are new uses of new plastics, some are novel uses of conventional materials. In addition, the plastics are employed in about all of the usual ways. Every one of the 80 applications is of a plastic material available today—the company left its "blue sky" thinking for the "House of Tomorrow" going up in Disneyland, in California. (See p. 143)

Among the more daring exterior uses for plastics in the 70,000 sq. ft. research center are reinforced polyester panels, both with and without honeycomb or polystyrene foam sandwich construction; foamed polystyrene panels for part of the roof; many acrylic windows and louvers, and polyester-faced concrete blocks.

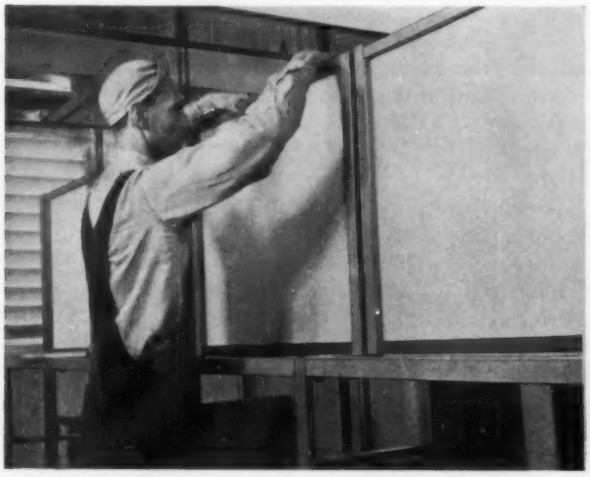
The polyester-faced concrete blocks are particularly eye-catching. In processing, the blocks are placed in a slurry of about 30% polyester, the rest being sand. Then they are passed through an oven on a continuous belt for a short baking period. A variety of colors can be obtained by pigmenting the sand. Monsanto claims that this is the first time such blocks have been used for outdoor construction.

An impressive indoor application of plastic in the building is the use of hundreds of feet of rigid p.v.c. pipe, up to 4 in. in diameter, with scores of complex fittings and joints which were fabricated on the job.

Other inside uses of plastics include molded polyester exhaust fan housings, control dampers on laboratory hoods, and closing strips on mullions. A constant-temperature room is insulated with vinyl foam. Urethane based paints are used on exposed concrete floors and for corrosion resistance on structural steel.

Monsanto's philosophy is similar to that of Alcoa when that company built the first alumi-

num-faced building for its own headquarters in Pittsburgh: If a producer doesn't have the faith to use his own material, who else will? At a preview of the building, Monsanto officials explained that the applications shown were intended as a demonstration of what is possible with plastics in construction within the framework of conventional building practices and existing data. Further, many young and some brand-new plastics applications will get thorough use tests in the structure and valuable information will be gathered about their serviceability. Already, all of the outdoor construction has gone through a severe winter without showing any indication of weathering or leak-through.



Installing an office partition: impact styrene extrusions that slip into standard steel frame channels provide snug fit for reinforced polyester sheets



Easily installed lightweight louver-type acrylic windows block glare of sun's rays yet permit passage of indirect light



Conventional layed-up roof being applied over a 2-in. layer of foamed styrene. Asbestos board placed atop styrene permits limited roof traffic



Polyvinyl chloride pipe finds extensive use in labs. (Steam and hot water is carried by insulated metal lines.) Intricate joints were welded on job

SUPER SIGNS FOR

Confronted with the growing complexity of present-day super-roads, highway engineers are finally facing up to the deficiencies of conventional directional signs. They find the need for better signs particularly pressing at intersections and other points where the motorist must be guided through a multiplicity of potential choices of direction. In their search for methods of eliminating delays caused by drivers who have to slow down or stop in order to decipher directions, they are turning increasingly to internally lighted acrylic signs.

The New York State Thruway Authority has recently installed 19 such signs at the Suffern, N. Y., interchange, a focal point of three major routes handling an exceedingly heavy volume of traffic. Mounted overhead for all-lane visibility, the acrylic signs are so designed that the legend at one location gives the driver a preview of the information on the next sign, so that he can execute all necessary maneuvers without reducing speed. This technique, coupled with the unvarying clarity of the signs, has resulted in a surprisingly smooth traffic flow at these busy crossroads.

Why acrylic was chosen

Several reasons were among the important factors in prompting the decision to go to acrylic signs:

1) The material has good light-transmitting and diffusing properties; has good dimensional stability; is virtually immune to discoloration and fading; resists effects of weather, corrosive atmospheres, and industrial fumes; has high impact characteristics; and its weight is only half that of glass.

2) Sky glow produced by near-by towns and

Strong visual impact of acrylic signs permits motorist to choose his proper lane without hesitation. Sign in left foreground is 37 ft. long, probably the longest internally illuminated highway sign in the United States

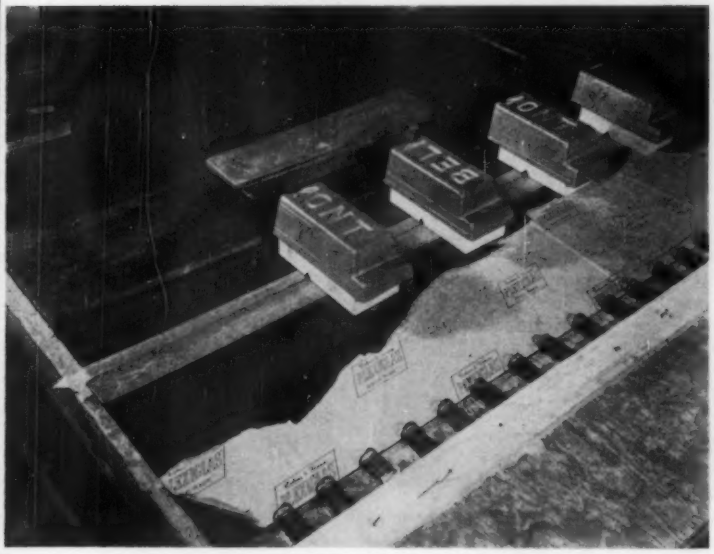


SUPER HIGHWAYS

Day- and night-time legibility cuts delays, smooths flow.

Molded-in colors make repainting unnecessary.

Weatherability assures long service life with minimum of maintenance



Bubble-free bond between two acrylic sheets is achieved by using compression springs to keep sheet edges in full contact. Weights placed on seam minimize bulging



Seam area is ground down to remove swelling that occurred during cementing. Area will next be polished and will then have same thickness and appearance as adjacent sheets

industrial plants does not impair night-time legibility of the signs, and this is in spite of the fact that they are seen by the driver against the skyline.

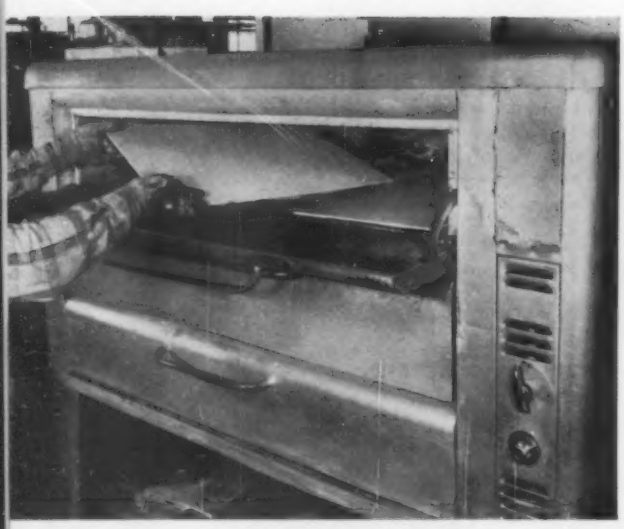
3) Since the pigments in the signs are dispersed throughout the material, no retouching or repainting is necessary to maintain original coloration or appearance.

4) Good diffusion of the material not only assures good night-time legibility but also contributes an important safety factor: if some of the internal lights fail, the section of the face in front of the inoperative lamps will still be sufficiently legible because the plastic diffuses the light from the remainder of the functioning lamps.

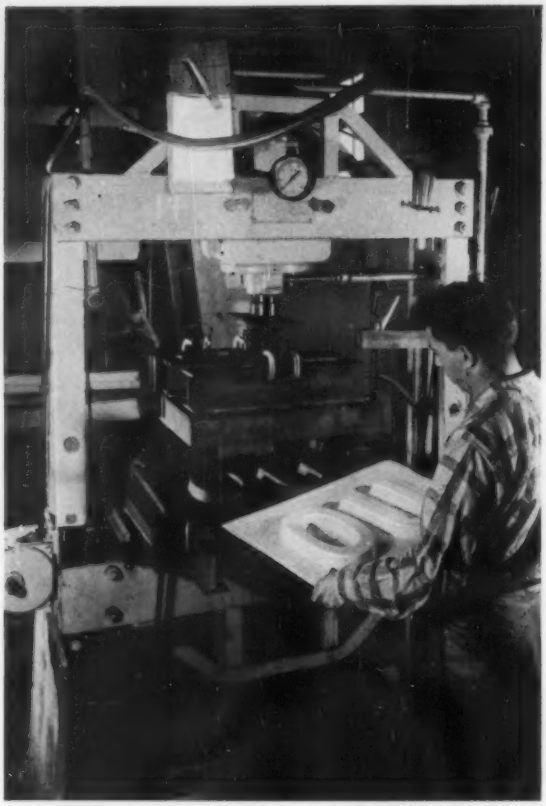
Signs are among largest made

All of the signs are 4 ft. high and 11 in. deep. Their length varies from 15 to 37 ft., depending on legend and letter size. The 37-ft. sign is probably the longest internally illuminated highway sign in the United States today.

Letters are made in three heights—18, 15, and 10 inches. The 18- and 15-in. letters are used for one-line legends the 10-in. size for two-



Translucent white acrylic sheet from which letters will be formed is softened by heating it in oven to 300° F.



Operator removes formed letters from 200-ton hydraulic press; letters were formed over wooden male mold

line signs. Sign faces are made of $\frac{3}{16}$-in. translucent dark blue acrylic sheet; letters from $\frac{1}{8}$-in. white translucent acrylic.

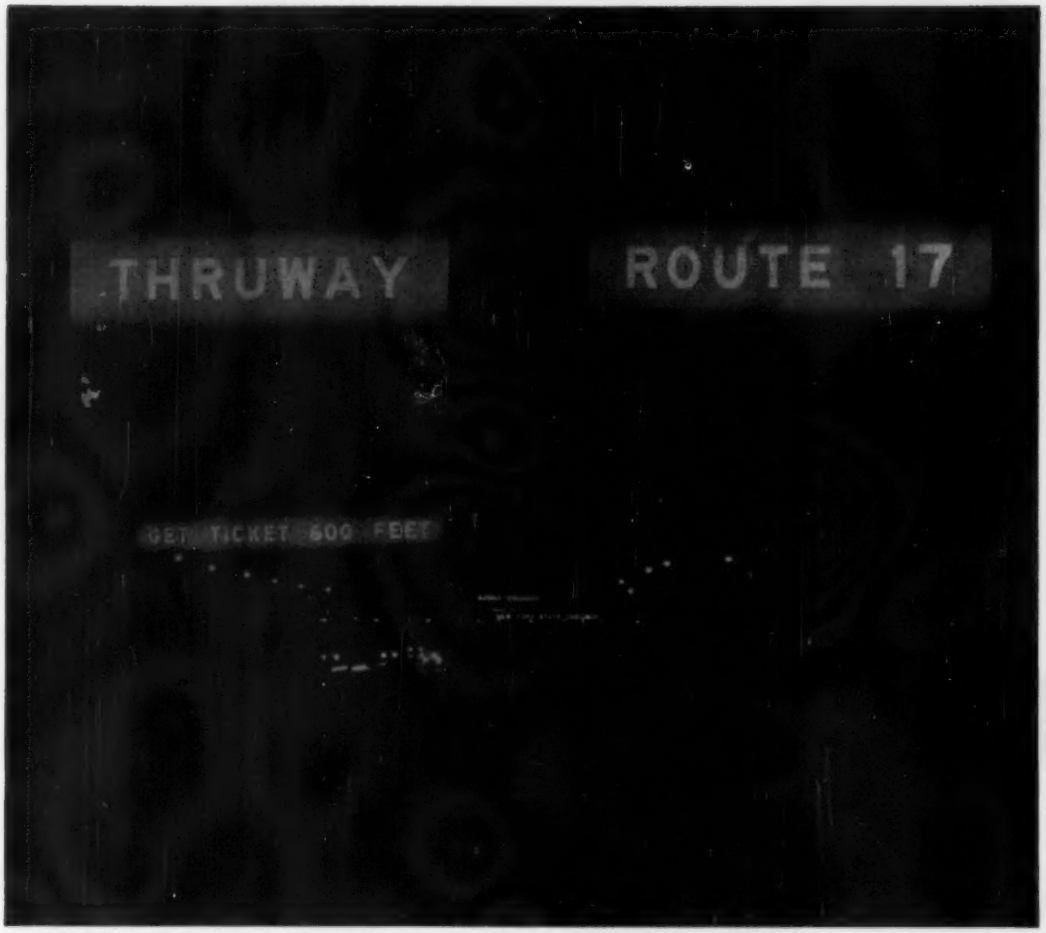
Faces are fabricated from sheet in 6-ft. lengths. To obtain the requisite sign dimension, several such sheets are butt-joined. Since it is essential for optimum legibility that the seam areas be undetectable when the sign is illuminated, special care is used to achieve an invisible joint. Edges of sheets to be joined are first mitered and then cemented together with a mixture of methyl dichloride and methyl methacrylate. The method of achieving a bubble-free joint with the same light transmission as the surrounding areas, is shown in two of the accompanying photos.

In fabricating letters, the sheet is heated to 300° F., and placed over wooden male molds in a 200-ton hydraulic press. The press head seals the edges of the sheet against the platen in the press bed and air pressure is applied to force the limp sheet to conform to the molds. The main advantage of this forming method is that it keeps tooling costs to a minimum.

The sign material behind each letter must be removed to assure full light intensity at the letter face. This is done with a portable electric router after the letters are cemented in place with methylene dichloride. A guide wheel causes the bit to follow the letter contours and is so arranged that the sign material overhangs the edge of the letter by about $\frac{1}{8}$ inch.

Erected on tubular overhead supports, the signs channel all traffic smoothly and easily into the proper lanes. And the unanimous reaction of motorists and highway officials: wonderful.

Credits: Signs fabricated by Steiner Plastics Mfg. Co., Inc., Glen Cove, N. Y., from Plexiglas acrylic sheet supplied by Rohm & Haas Co., Philadelphia, Pa.



Light-diffusion characteristics of acrylic sheet assure good night-time visibility



Contours of trimmed letters is scribed on acrylic sheet prior to cementing to achieve correct positioning



Letters are dipped in methyl dichloride and then cemented over their scribed contours. For good bond, letters are weighted while cement dries. (Photos, Rohm & Haas)

Butyrate on the

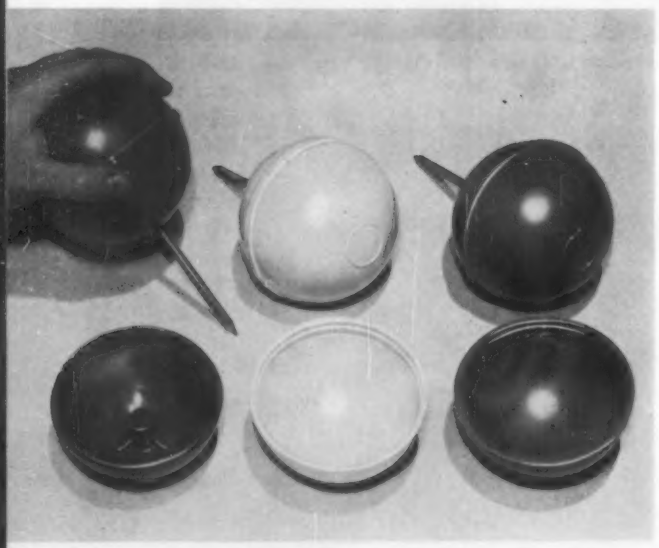
Tee markers and agitator of golf ball washer are molded of light weight, tough material having low water absorption



Agitator and knob-type handle of washer are molded of black butyrate. Molded-in hole accommodates golf ball to be washed. Screw-in plug at bottom of washer (below hand) is molded polyethylene

Molded plastic components play a key role in two new pieces of golf course equipment made by Progress Foundries, Inc., St. Paul, Minn. These are the company's Par-Aide golf ball washer, which includes an ingeniously designed helical agitator molded of cellulose acetate butyrate, and the Par-Aide tee markers, which are 4-in. diameter hollow spheres molded of the same material.

The entrance of Progress Foundries, which is basically a metal casting concern, into the somewhat unrelated field of golf course equipment came about through personal interest in golf by J. S. Garske, president of the firm. Convinced in his own mind that existing golf ball washers at that time were for the most part inefficient and generally unsatisfactory, Mr. Garske undertook the design of a washer that would do a better job.



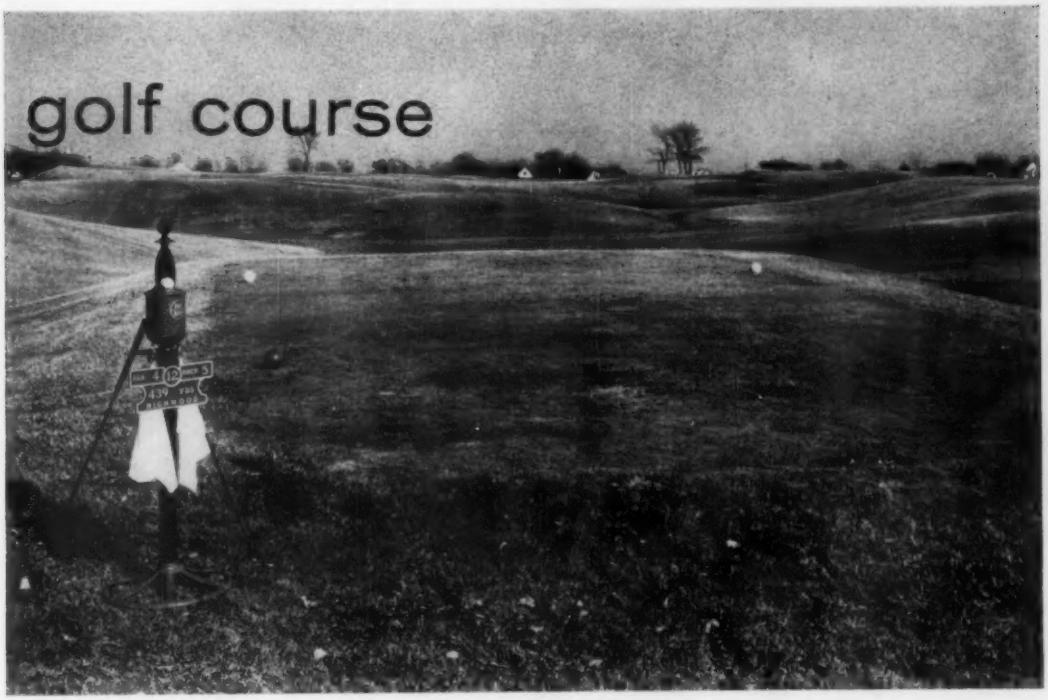
Mating tee marker halves in several colors, also molded of butyrate, are solvent-cemented together after inserting metal spikes in molded-in cored sleeve (lower left). Spikes anchor markers in ground

Early models tried

The prototype washer had a helical cast aluminum agitator which, when raised and lowered in the metal outer housing, rotated the ball and rubbed it against a sponge rubber cleaning surface. To obtain greater cleaning action, a brush with Tynex crimped nylon bristles set in a $\frac{3}{32}$ in. thick rubber back later replaced the sponge rubber component.

Next, the agitator was studied with a view to possible improvement. Although the original cast aluminum agitator did an effective cleaning job, it was heavy and quite noisy in operation.

In studying possible alternative materials, Mr. Garske first thermoformed an agitator from sheet acrylic, which proved quite satisfactory, but cellulose acetate butyrate was finally selected for producing molded pieces. The first 5000 molded agitators were produced in the same die used for casting the aluminum agitators. Later, this was replaced by a new



Golf ball washer (left) and tee markers (center) provide trouble free service, thanks to use of butyrate. For detailed close-ups, see photos at left. (Photo, Par Aide Products)

two-cavity mold which is run on a 16-oz. machine.

Among the qualities of butyrate which qualify it for this application are its toughness, dimensional stability, and low water absorption. In addition to its excellent resistance to breakage, abrasion, and chemicals, the plastic agitator is light in weight and easy to handle. Its design, like that of the earlier aluminum agitator, imparts a spinning action as it is raised and lowered, assuring thorough cleaning of the entire surface of the ball.

Also of butyrate, and molded in two halves, is the knob-type handle for the top of the agitator. Produced by a custom molder, this component is mounted on the end of the agitator by Progress Foundries. The two mating halves of the handle are assembled on a metal shaft which is molded into the top of the agitator as an insert.

Another insert, on the lower end of the agitator, is threaded at the tip to receive a nut which locks the agitator shaft in position in the washer. A black polyethylene drain plug, which screws into the base of the ball washer housing, is also injection molded.

The plastic agitator is assembled inside a vinyl-coated steel cylinder in which the brush holder is mounted; the cylinder, in turn, has an exterior housing of cast aluminum finished with red alkyd resin paint, air dried.

Also developed under Mr. Garske's direction are the spherical 4-in.-diameter tee markers. Produced in red, white, and blue butyrate, they are ideal for separating men's, ladies', and championship tees. Molded in two mating halves, the markers are produced in a four-cavity mold, run on a 16-oz. injection machine, which makes parts for two complete tee markers at each shot. The two halves of each marker are assembled by the molder by solvent welding, after the metal spikes which anchor the unit in the ground have been inserted in the lower half. This section of the lower half is molded with a cored sleeve which fits the spike tightly.

Unlike the cast aluminum markers which they supplement and which cost approximately three times as much, the butyrate markers require no external finishing, since the colors are integral. The economy of the plastic markers has eliminated much of the pilferage experienced with the metal markers.

Credits: Butyrate agitator and halves for tee markers produced by Minnesota Plastics Corp., St. Paul, Minn., using Eastman Tenite material. Agitator knob and polyethylene drain plug for ball washer, Wilcox Products Co., Minneapolis, Minn.



Laminate wall tile

New square wall tiles with delicate decorating materials laminated between sheets of rigid vinyl offer interior wall coverings of distinctive pattern and serviceability. All the patterns are formed by free-hand art work and lay-ups; no printed patterns are used. Decorative materials also include butterflies, grasses, leaves, fibers, metallic flakes, etc. Because of the nature of the inserts, laminating is done on flat-bed presses. The back of the laminate is white or colored vinyl sheet; the front is clear textured sheet.

The tiles, 10-in. square, are easily bonded, even by amateurs, to almost any clean, dry wall, using a special adhesive developed for the purpose. They can be readily cut with scissors when fitting is necessary at corners, chair rails, etc.

Credits: Lam-O-Tile squares are produced by Laminated Plas-Tex Corp., Springfield, Ohio, using rigid vinyl sheets supplied by Bakelite Co., New York, N.Y.

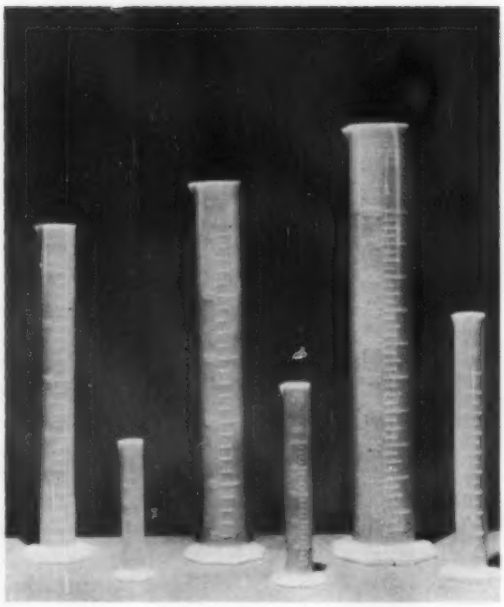
PLASTICS

Graduated cylinders

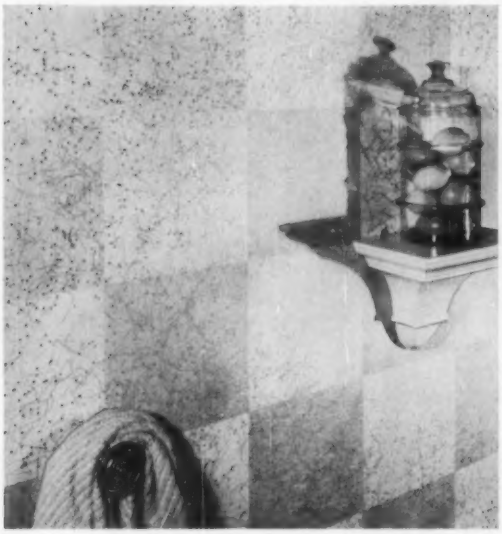
Molded of linear polyethylene, a new series of graduated cylinders for laboratory use is now available in six sizes: 25, 50, 100, 250, 500, and 1000 ml. The graduates, molded in one piece, are made dimensionally in accordance with N. B. S. standards and are reported to closely approach these standards for accuracy. The bases are octagonal in shape for extra stability and to prevent rolling.

To laboratory supplies of this nature, polyethylene brings the outstanding advantages of resistance to breakage, light weight, and ease of cleaning. In addition, it is one of the most inert materials known at room temperature and is not affected by many chemicals at elevated temperatures. Because linear type polyethylene is used in the graduates described above, it is claimed that they can be autoclaved under standard conditions.

Credits: Cylinders molded for The Nalge Co., Inc., Rochester, N.Y., by American Plastics Co., Cleveland, Ohio, on a 20-oz. Reed-Prentice injection molding machine.



offers new effects





PRODUCTS

Nylon baster

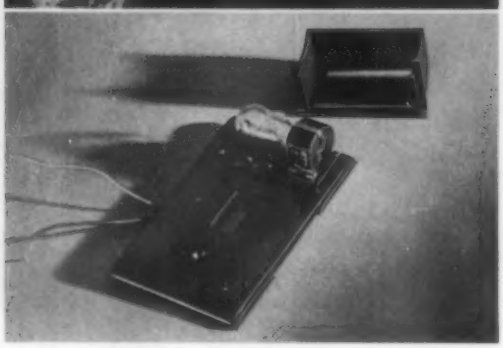
Replacing fragile, breakable glass in the tube of an all-purpose baster for kitchen and household use, molded nylon brings to the application strength to resist shattering, heat resistance to withstand the high temperatures used in cooking, and light weight for convenience in use. Although not transparent, the nylon tube is sufficiently translucent for the user to see at all times the height of the liquid drawn in when pressure on the rubber bulb is released. Suggested uses for the baster, aside from its conventional basting jobs on roasts, fowl, etc., include separating grease from gravies and stews, skimming broths and milk, and watering houseplants.

Despite the fact that nylon is more expensive than glass, this E-Z Flow baster is priced competitively with glass units. In addition, so positive is the manufacturer of the strength of its product that the baster is guaranteed for life.

Credits: Baster molded by Plastics Consolidated Industries, Newark, N.J., using Du Pont's Zytel.







Phenolic night light

Designed to replace a regular switch plate, a new permanent night light molded of phenolic provides enough light for safety in moving around an ordinary size room. When the main light is switched off, the small pilot light comes on, illuminating the switch and the wall and floor area. A small auxiliary switch controls the pilot light. Attached to any single pole switch or three or four way system, the light operates from the switch circuit only.

The light is installed by attaching the lead wires to the toggle switch terminals. It is out of the reach of small children and leaves the outlets (where night lights usually go) free for other uses. The Owlite, for hospital, home, and commercial use, is produced in brown material.

Credits: Manufactured by Owlite Co., Pittsburgh, Pa. Molded by Squires Plastics, Inc., Verona, Pa. Phenolic molding compound supplied by Durez Plastics Div., Hooker Electrochemical Co., N. Tonawanda, N.Y.

PLASTICS

Film "greenhouses" for individual plants



Miniature greenhouses of polyethylene film protect young plants in their first few weeks outdoors from strong sun, heavy rain, drying winds, and the danger of late frosts. The Wigwarm plant protectors are furnished in kits containing an aluminum ring base, three aluminum ribs, and a polyethylene film cover. The film has an opaque white front and back, to act as a shade against mid-morning sun, and transparent side, for observation.

Plants under the film covers get added warmth and humidity; a top vent prevents excessive heat build-up. Larger sizes are available for use as frost protectors for late-blooming flowers in the fall, or snow covers for broad-leafed evergreens in winter. The protectors are inexpensive to use and easy to set up by following simple directions.

Credits: Manufactured by Aldon Products Co., Duncannon, Pa. Film cover made of polyethylene supplied by Bakelite Co., New York, N.Y.



Child's car commode

A boon for motorists with young children, this children's commode, the Car John, is provided with a disposable polyethylene liner. The outer bucket is formed of treated fibroid (paper) material, while the seat cover and lid are molded of polystyrene in a two-cavity combination mold.

The product is supplied with six disposable polyethylene bags which are held in place by the seat cover when in use. Additional bags are obtainable in packages of six. The commode may also be used as a receptacle for soiled diapers, for car-sickness emergencies, or for toilet training in the home. The product, decorated in bright red and white stripes, is available with or without the styrene tissue dispenser illustrated.

Credits: Manufactured by Travel Aids Co., Brooklyn, N.Y. Bucket formed by Lily-Tulip Cup Corp., New York, N.Y. Polystrene supplied by Koppers Co., Pittsburgh, Pa. Liners fabricated by Visual Bag Co., Bronx, N.Y.

PRODUCTS



Plastic tile spacer

A new polystyrene grout strip has been developed to insure uniform and permanently clean spaces between plastic wall tiles. With any wall tile, the exposed paste or cement areas between the tiles eventually become dirty. With plastic tile, applied by the do-it-yourselfer, an added problem is the difficulty of getting the lines even. The plastic grout strips are easy to install and their maintenance is equally simple.

Laid between the tiles horizontally and vertically during installation, the new plastic strip, supplied in 18 in. lengths, keeps the panels exactly 1/10 in. apart. Unlike porous paste or cement grouts conventionally used between tiles, the plastic grout strip can be wiped clean with a damp cloth.

Credits: Manufactured by Artcrest Plastics Co., Chicago, Ill., from polystrene supplied by Catalin Corp. of America, New York, N.Y.

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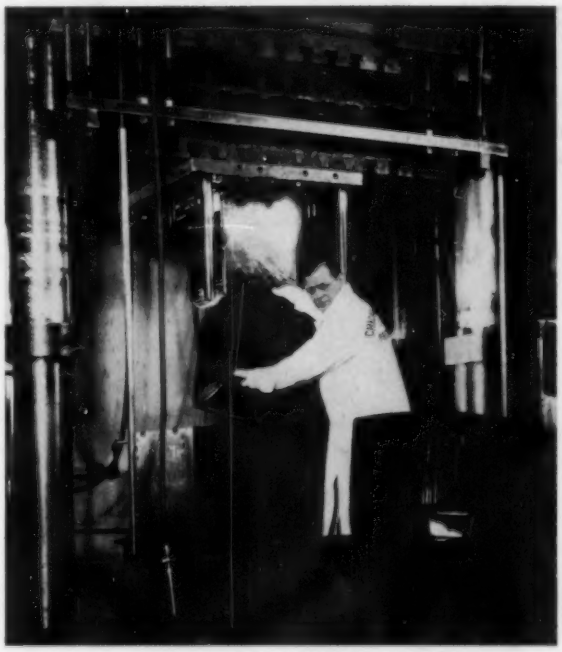
High-frequency preheating of ureas

Big moldings can be made with the fast-curing urea resins by the aid of carefully controlled high-frequency preheating

By H. E. Murray†

High-frequency preheating, long believed to be adaptable only to phenolics and melamines, has —within the past two or three years—opened new avenues in the molding of ureas. Many large moldings, comparable in weight and area to the largest phenolic moldings, have been and currently are being produced in ureas quite readily through the use of high-frequency preheating.

Urea molding compounds differ from phenolics and melamines in that they have a much shorter "induction period"; that is, they start to cure rapidly once they are heated. If a urea molder used preheating procedures that served well in molding phenolics he would be likely to find that his material would cure before the mold closed. Preheating of urea is therefore a much more critical operation than the preheating of other thermosets. In the past few years, developments* of new resins with somewhat longer flow times, higher-frequency preheating equipment that gives more



Molding Motorola television cabinets at Chicago Molded Products Corp. The 26-lb. shots are preheated at 60 megacycles. Cabinets are molded with 1000- to 1100-ton force on a 360-sec. cycle. Mold temperature is 275 to 280° F. It is doubtful that these cabinets could have been molded on a commercial basis without preheating

*Reg. U.S. Pat. Off.

†Glendale-Plaskon Laboratory, Barrett Div., Allied Chemical & Dye Corp., Toledo, Ohio.



Production set-up at Sperzel Co., Minneapolis, Minn., showing urea toilet seat molding operation. At left rear is a 10-kw., 60-mc. Thermex preheater. The 800-ton press operates at about 600 tons on this job. Operator is weighing molding compound; each seat requires 4.25 pounds.

uniform heating, and closer control of preheating procedures have combined to make possible large urea moldings. These developments have probably been spurred by increasing demands for large thermoset moldings, such as TV cabinets, in light colors.

Preheating plays a vital role in the molding of large-unit shapes in urea. It increases effective press pressures by as much as 50% and it shortens the molding cycle.

High-frequency preheating causes faster off-gassing and better fusion and flow properties, producing stronger and smoother surfaces. Its speed and evenness of distribution assure uniformity of flow and synchronism of cure throughout the entire mass. This is especially important in large moldings with thick sections—many of which would be next to impossible to mold without high-frequency preheating.



Charge of urea molding compound next is divided evenly and spread uniformly in two polyethylene trays to a thickness of 2 inches. Generator heats compound to 160° F. in 150 seconds. For subsequent operations, see photos below and opposite.

Use proper compound

Granular housing-type urea molding compounds normally should be specified for all large molding jobs. They are the most suitable because of improved fusibility, resulting in non-streaking characteristics, resistance to cracking caused by internal stress and strain, and all-round general moldability. They are normally molded in the temperature range 250° to 275° F. Their flow is soft and of long duration, permitting side-wall flows of 20 in. or more.

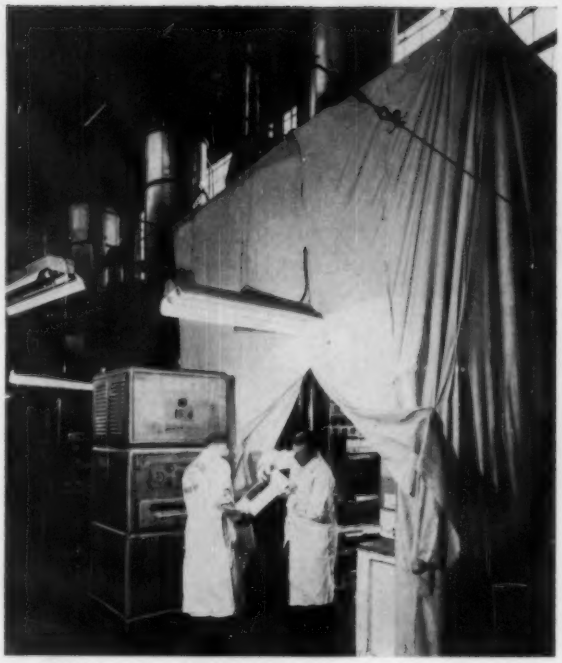
While preforming is used almost universally in molding small urea parts, it is seldom used for large moldings because it can result in streaking at the pill boundaries. The preforming operation, with its attendant handling, increases the risk of contamination. It is much easier to get uniform heat distribution with relatively large quantities of



The two containers of electronically preheated molding compound are poured into a seat mold . . .

granular material. With modern handling techniques, the operator has ample time to weigh and preheat the material during and within the molding cycle time.

With these light-colored materials, the molder must be much more careful to avoid contamination with dust and dirt than with phenolics. Such contamination results in specks and streaks—and rejects. Thus, at Chicago Molded Products, the area in which a white urea scale housing was being molded was curtained off to prevent contamination of the molding powder by dust from surrounding areas. Special precautions were also taken in dispensing the molding powder from the Leverpak drum.



Toledo meat scale production area at Chicago Molded Products Corp. Because of other jobs running in adjacent areas, curtains are used to prevent contamination of white urea molding compound

Preheating practice

Urea molding compounds, with their relatively short molding cycle, must be preheated rapidly to from 160 to 170° F. to prevent premature cure during loading. The answer, of course, is dielectric preheating. While several kinds of generators have been successfully used in actual production operations, the higher-frequency equipment is strongly recommended for quick and even heating. It has been noted that generators in the lower-frequency range (30 mc.) tend to heat preferentially next to the hot plate—which may be either top or bottom depending on the make. Hence, if the lower-frequency generator *is* used, best results will be obtained by widening the plate gap and heating for a longer time. Generators operating at 60 to 70 mc. will give a more uniform heat in much less time.

High-frequency preheating has been used most successfully on

(*To page* 142)

After completion of molding cycle, seat is removed. Note molded-in sockets for bumpers and the steel blocks which pre-position the metal inserts which form part of the special Sperzel seat hinge. (Photos, Barrett Div.)

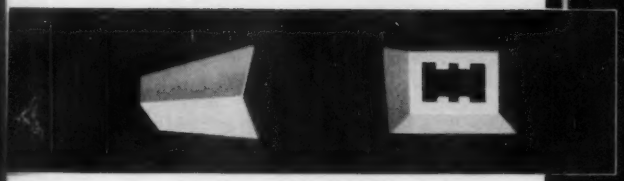


. . . and distributed manually by operator evenly around the mold; mold is then closed

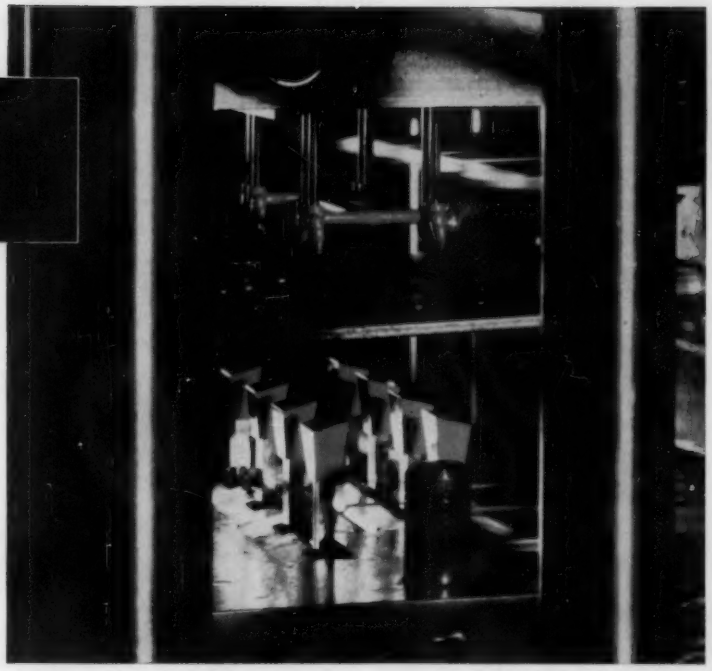




The Stokes Model 701 installed in the plant of the Emeloid Company. Its simplified, fully automatic operation requires minimum attention.



Typical pushbutton produced on the Stokes 701. Note the tapered design and the clinch-type mounting hole. This finished product has had the hot-stamped legend applied.



A close-up of the die table showing the eight parts, simultaneously produced, about to be stripped off. Note the sprues and runners above the separating plate —these will be delivered through a separate chute to the scrap collection bin.

Emeloid produces millions of better parts—at lower costs—with a Stokes 701 Injection Molding Press

Fully automatic injection molding with a Stokes 701 enables this custom molder to increase production by 20%.

The Emeloid Co., Inc., of Hillside, New Jersey, has been a custom molder of plastic products since 1919 —with over a quarter of a century experience in injection molding. They recently installed a Stokes 701 Automatic Injection Press for high speed production of pushbuttons for home appliances. The wisdom of the investment has been proven by a 20% increase in production with the same number of mold cavities.

Fully automatic operation of the Stokes 701 enables Emeloid to produce better parts—with a lower reject rate and higher production yield. The better quality enables them to perform faster, more satisfactory after-operations such as the hot stamping of identification legends.

Extremely simple tooling of the 701 requires less expensive molds—reduces changeover costs. The precision operation provides a higher degree of uniformity and quality of finished parts. Fully automatic, this press requires less attention, produces on faster cycles and with higher efficiency.

Stokes patented ejection system positively clears all parts and runners from the die. Secondary protection is provided by use of the more common low-pressure close. Completely self-contained, the vertical design of the 701 saves floor space—permits easy sorting and separation—facilitates mold set-up.

Write for your copy of literature on the Stokes 701 —the truly automatic 2-ounce injection molding press. Ask for a Stokes production analysis on your own parts.

Plastics Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

Table I: Sample procedures for preheating ureas

Charge weight	Number of containers	Dimensions of blankets	Time at 60 mc.
lb.		in.	sec.
5	2	5 by 12 by 2	135
9	3	5.5 by 12 by 2	150
26	1	20 by 20 by 2.5	240

such familiar large urea moldings as the Toledo scale, Motorola TV cabinet, and Sperzel toilet seat. In these applications, carefully weighed charges of the molding compound are placed in low-loss containers made of polyethylene or (more expensively) fluorinated resins. For large moldings, particularly those incorporating numerous bosses, ribs, etc., special granulation types of urea molding compound from which the fines have been screened out are now available. These have been found to be most suitable. To get uniform preheating the granular molding compound is spread in the preheating container in a blanket no deeper than 3 inches. To facilitate handling and to keep the blanket thin, two or more preheating containers will usually be desirable.

The blanket of powder being preheated should be centered between the two plates of the dielectric heater. Polyethylene spacers will insure accurate, reproducible centering.

When preheated according to these recommendations to from 160 to 170° F., granular material will be slightly tacky. Its tackiness can be judged by touch. Three actual preheating cycles for different charges are given in Table I, above.



Dispensing device developed by Chicago Molded for handling light-colored thermosets with minimum chance for contamination. Operator is shown filling preheating container



Charging mold with 3¾ lb. of white urea molding compound to produce one of three body moldings for Toledo scale



After 20-sec. cycle, molding is complete

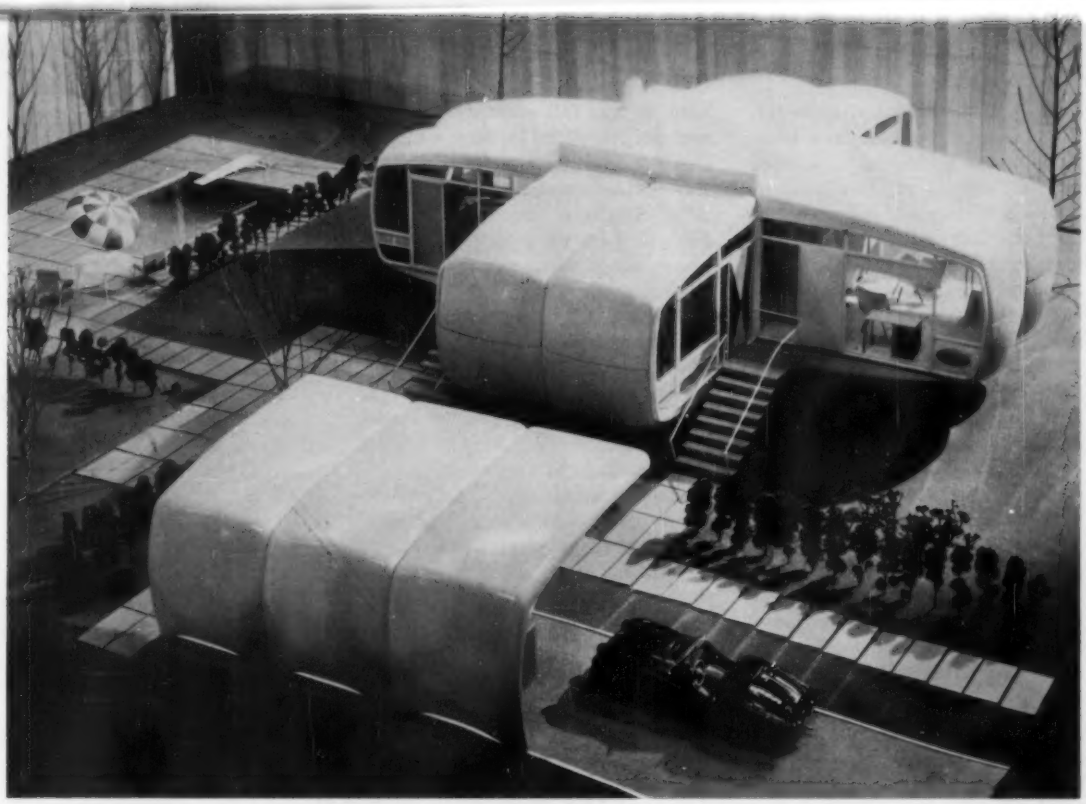


Fig. 1: Early scale model of the five-room plastics house, with carport. At one time, consideration was given to mounting entire house on rotating pedestal. This would make best use of solar heat in winter, but would severely limit site selection

Engineering the plastics "House of the Future"

Part 1

By A. G. H. Dietz,[1] M. E. Goody,[2] F. J. Heger, Jr.,[3] F. J. McGarry,[4] and R. P. Whittier[5]

A plastics house of the future has been designed with an eye to convenience, beauty, and versatility of location. Made of a few large parts rather than many small ones, the design takes advantage of the almost unlimited formability and fabricability of plastics. The engineering analysis of the complexly curved structure is discussed in detail. Perhaps its most remarkable feature is that rigidity rather than strength dominated the design, resulting in a house with strength to spare. Because of the high coefficient of thermal expansion of the reinforced plastics material used (typical of plastics in general), stresses due to thermal expansion play an important role in the design. Weight-loading and thermal loading of full-size prototype test structures have shown the design to be sound in all its aspects.

The first half of this article discusses the architecture of the house, the loads it must bear, and materials consideration. The second half covers the design of the structure to withstand these loads, and the testing of the prototype.

Over the past ten years plastics materials have been used more and more in homes. Housewares, counter tops, flooring, wall tile, upholstery, tableware, electrical hardware, appliances, awnings, and toilet seats made of plastics have found wide acceptance. Polyethylene film is gaining reputation as an effective moisture

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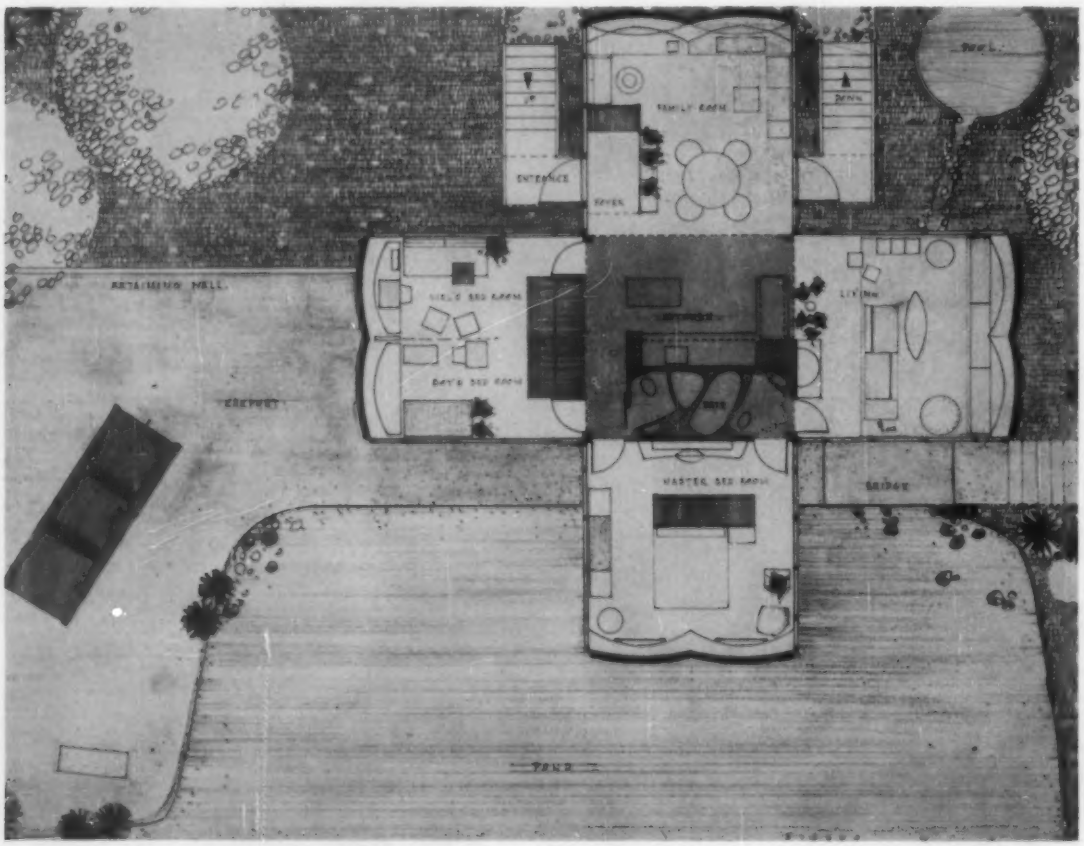
barrier. Until recently, however, little serious thought has been given to the usefulness of plastics in the structural elements of housing, a tremendous potential market. This reluctance to use plastics structurally stems mostly from the fact that architects, engineers, and construction men are much more familiar with concrete, brick, wood, and steel than they are with plastics. To help provide the needed education, Monsanto Chemical Co. has undertaken the design and construction of a plastics "house of the future." This house is being erected at Disneyland for exhibition in June 1957.

While it might have been possible for personnel of Monsanto to have designed and engineered a plastics house without outside help, it was felt strongly that a sounder job would be done if professional architects and engineers were placed in charge of the design. Similarly, the engineering firm of Lessells and Associates was retained as experts on strain gaging.

In the design and construction of the house, an effort was made to develop a plan which would be logical from the standpoint of living and, at the same time, would be unencumbered by preconceived notions of a house built of traditional materials. The underlying thought was that plastics should, as far as possible, be used in this house as plastics rather than as substitutes for other materials. If the only accomplishments would have been the substitution of plastics for wood in 2 by 4s, for steel in I beams and channels, and so on, there would have been no point in beginning. Since plastics can be molded into various shapes and can be made in continuous and curved shapes, the aim was to try as far as possible to combine structure and enclosure and any other feasible attributes so as to make the plastics do the job they could do to the best advantage. Every effort was made to use plastics where they could reasonably be used, but for any sections of the house for which plastics were not logical materials, other materials were employed.

The architectural considerations led to a cross-shaped house (Figs. 1 and 2) consisting of a core with four wings. In the core are grouped the utilities; in the four

Fig. 2: Latest plan view of plastics house, with suggested workable layout of living space. Children's wing (left) can be divided into two rooms with plastics partitions (broken line). Cross shape assures full daylight in every room, reduces inter-room noise (rooms in wings have no common walls). Free-form bathrooms accommodate separate tub and stall shower while still allowing more kitchen space than original rectangular bathroom layout that had only one common tub and no shower. (Illustrations, Monsanto Chemical Co.)







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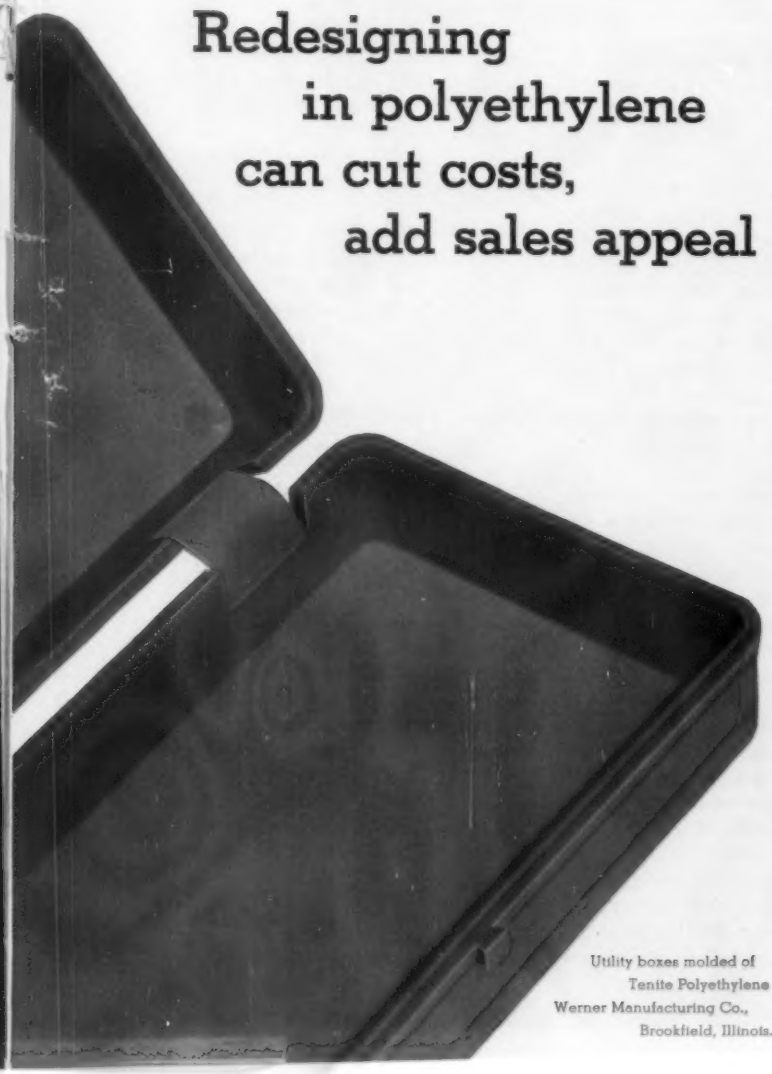
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Utility boxes molded of Tenite Polyethylene by Werner Manufacturing Co., Brookfield, Illinois.



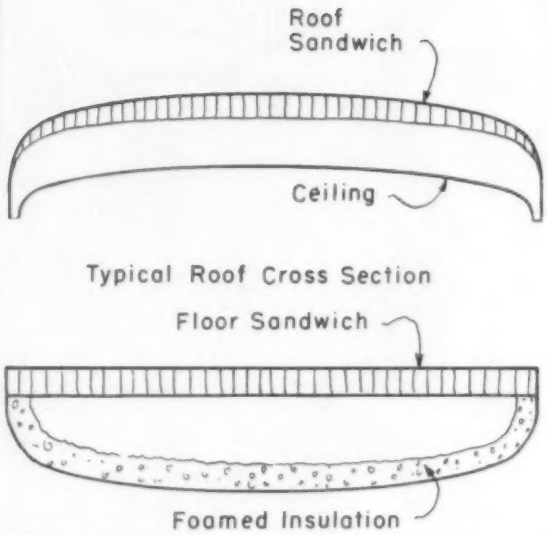


Fig. 3: Typical cross sections of hollow box girders that make up roof and floor bents. Tops of bents are stiff, strong, load-bearing sandwich structures with 0.3-in. reinforced plastics skins and lightweight foam cores. Bottom of lower bent is not sandwich; foam serves only as insulation

wings are the living area, dining area, and sleeping areas.

The cross-shaped plan permits use of a small, compact foundation concentrated under the central core of the house with the four wings cantilevered from it. This considerably simplifies the foundation and, at the same time, makes the house adaptable to a wide variety of sites. The fact that cantilevers can be formed in a relatively few, large molded sections points to the use of formable plastics as opposed to the usual method of building a house from many small pieces.

The core of the house includes a floor over the foundation section, four columns, and a roof and ceiling section. Because shipping restrictions require that at least one of the principal dimensions be 8 ft. or less, and because each of the sections of the house is 16 ft. square, it follows that the portions of the core can be no larger than 8 by 16 feet. The same limitation applies to the wings.

The floor sections of the wings are hollow girders (bents) each consisting of an outer molded portion and an inner flat section. The outer molded shell extends from the foundation outward and upward to the half height of the end wall; the inner section consists of a flat floor sandwich capable of carrying the floor load (Fig. 3). Similarly, the roof outer shell (Fig. 3), which is identical with the floor outer shell, extends from the central core section outward and downward to the half wall height, and the ceiling section consists of a curved panel extending from the central core area out and downward to the half wall height. Two floor sections and two roof sections constitute the entire structure of each wing. The sides of the wings are non-structural and, consequently, can be wholly or partly transparent, as desired.

Since the outside contour of the roof is the same as that of the floor, the same mold can be used to make all 16 of the outer shells. This is not true of the inside ceiling and floor pieces, which differ, the floor being a plane sandwich and the ceiling a curved skin.

The engineering design approach to any structure is twofold: First, the forces to which the house is subjected and the resulting stresses induced in the structure of the house are analyzed; second, materials are selected and allowable stress levels are set.

In the design of this house, a variety of short-time and long-time loads had to be considered. The two together determine the required strength, while the long-time loads, such as the dead weight of the house itself, determine creep requirements. It was equally important in this house, with its long cantilevers, to design for stiffness. The structure had to be sufficiently rigid to give a comfortable feeling of solidity. All of these factors entered into the selection of working stresses as well as into the selection of materials of sufficiently high moduli of elasticity to provide the necessary stiffness.

Another factor entering into the design of any structure is the possible presence of concentration of stress. Materials like structural steel are capable of plastic flow, or yielding, under high stress, with resulting redistribution of the stress into the surrounding regions. But reinforced plastics, especially those reinforced with fibrous glass, do not exhibit plastic flow and do not yield appreciably before failure. Stress intensities must therefore be kept relatively low and the stress analysis must be as exact as possible to discover where stress concentrations may occur.

Major forces

The major forces to be withstood by the house include 1) the dead load or weight of the structure itself; 2) a variety of live loads including occupants, wind, snow, and earthquake; 3) stresses caused by temperature differentials set up by the sun's heat on the structure.

Dead loads. Because of the design, the dead loads on this house are reasonably uniform and symmetrically distributed. The weight of each wing is very much the same as the weight of any other wing. Heavy mechanical equipment and plumbing are all concentrated in the central core. By utilizing sandwiches and curved sections which are inherently stiff and resistant to buckling, fairly lightweight construction is achievable and the floor and roof sections of the wings are each found to average approximately 10 lb./sq. ft. The weight of the core floor section, including floor and mechanical equipment, is ap-

Werner Manufacturing Co.,
Brookfield, Illinois.

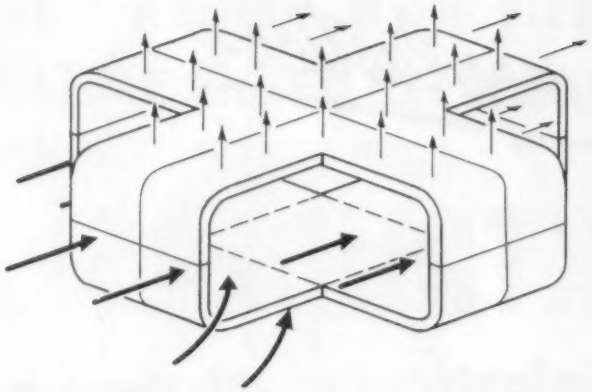


Fig. 4: Lateral wind loads (heavy arrows) cause pressure on windward side, partial vacuum on leeward side (light arrows in same direction), as well as uplift on roof and upthrust under projecting windward wing

proximately 15 lb./sq. ft., while the roof of the core section, like the wing sections, weighs approximately 10 lb./sq. ft.[1]

Live loads. Live loads occasioned by occupancy and by furniture must be analyzed for two types of conditions. First, it must be assumed that the full live load at some time or other is distributed over the entire structure. In that case, the live load is at a maximum but is uniformly and symmetrically distributed like the dead loads. It therefore causes no tendency for the house to overturn. The second analysis requires the assumption that the live load may be found only in certain portions of the house and that, consequently, various overturning moments may develop because of uneven distribution. These loads may include live load in one, two, three, or four wings, live load in the core section only, or various combinations of these conditions.

Wind. Wind loads depend upon the section of the country in which the house is expected to be built. The demonstration house is being built in the Los Angeles area, which is lashed by what are known as the Santa Ana winds with gusts up to 90 miles per hour. Several conditions may exist. First, there may be a uniform wind blowing against the entire side of the structure (Fig. 4, above). This results in a uniform wind load of so many p.s.f. over those walls. There is also a negative pressure on the lee side, because of a slight vacuum set up there. This means that there is another force exerted on the inside of the house against the far wall. Furthermore, wind blowing over a flat roof causes suction, or upward pressure, tending to lift both roof and house.

When the projecting cantilevers are on the windward side, especially where the terrain drops off, the wind hits the lower face of the foundation and sweeps up, causing an upward pressure which is about double the direct pressure (Fig. 4, left). Taking into account the usual reductions for buildings that are built close to the ground (where wind velocities are retarded), the resulting maximum direct pressure on the vertical walls is in the vicinity of 25 p.s.f. and the upward pressure on the roof is about the same.

Furthermore, because of the differences of wind velocity that can occur at different points of the building, a twisting movement can develop (Fig. 5, below).

Snow. Although the demonstration house is being erected in an area where snow loads are unimportant, snow must be taken into account in the complete analysis. This is a distributed load over the entire roof and may be combined with any combination of internal live load. But, it is not to be expected that full snow load will exist at the same time high wind velocities are encountered.

Earthquake. Earthquake loads are caused by horizontal accelerations of the earth. Consequently, they induce horizontal thrusts on the structure which, in turn, are proportional to the mass of the building. Various empirical formulas have been developed for earthquake thrusts. Because this house will be in what is known as a Zone 3 earthquake area, it had to be designed for maximum horizontal thrust (about 13% of the dead weight) tending to cause displacement and overturning. This thrust amounts to about 20 to 25% of the wind load and must be added to it since earthquakes and high winds may occur together.

Sun. The heat from the sun shining on the roof will raise its temperature to a possible 170° F. while the air conditioned interior will be maintained at approximately 70° F. The temperature of the floor section can be expected to rise only slightly, since it gets no direct sun. Actually, the greatest stresses arise when the floor section remains at 70° F. while the roof is heated to 170° F.

Plastics materials, including reinforced plastics, have coefficients

(*To page* 150)

[1]Ed. note: To cost-conscious builders, it is clear that at today's raw material costs this house doesn't qualify as low-cost housing: at 10 p.s.f., the total weight of reinforced plastic is well over 15,000 lb., and the material cost alone is over $15,000. Floor area is about 1250 sq. ft. This high material cost is partly offset by the relatively low cost of erecting the house, and might be as much as 20% less if the design were not so conservative.

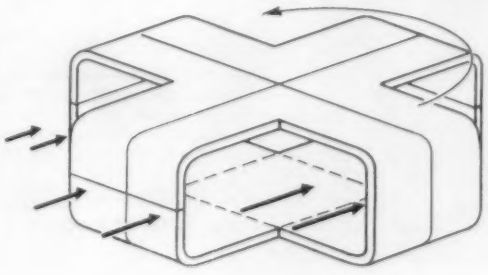


Fig. 5: Unequal wind loads may be heavier on an exposed side than on a sheltered side, causing a twisting moment (curved arrow) to be exerted on the house

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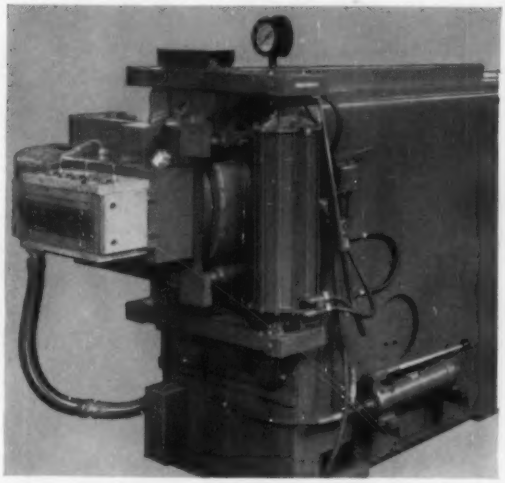
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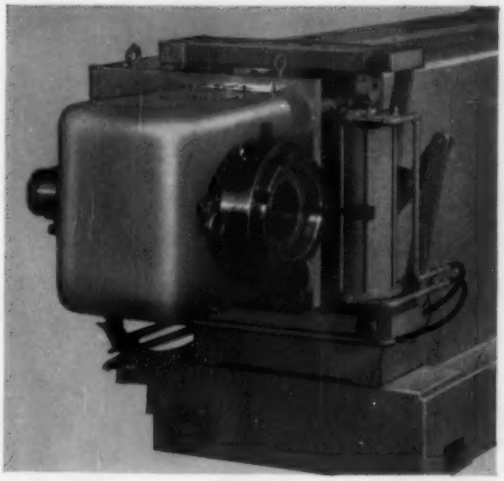
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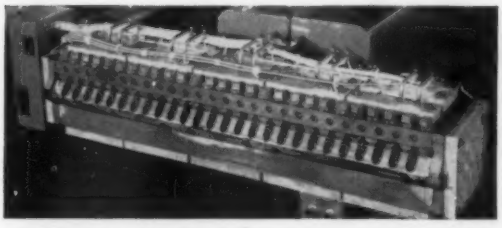
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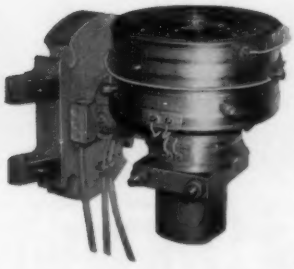


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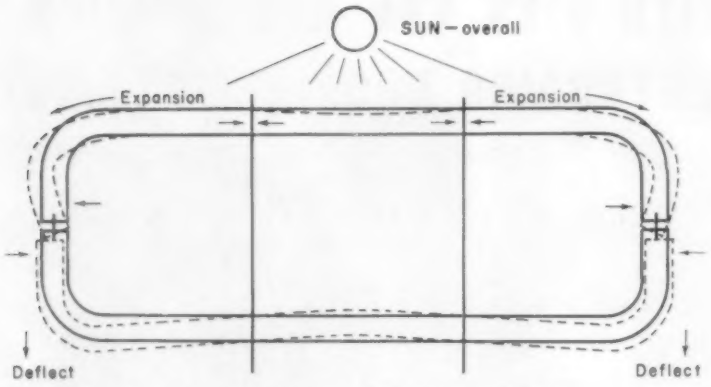


Fig. 6: Heat of sun expands roof while air-conditioned ceiling and sheltered floor bent try to keep original dimensions. Since upper bents are pinned to lower, over-all result is that shown (exaggerated) by dashed lines

of thermal expansion 2 to 8 times as large as those of other construction materials including metals, concrete, and wood. Furthermore, in this house and in contrast to most house construction, a few individual large units are tightly fastened together and, consequently, cumulative expansion can occur over the entire 48-ft. length of two wings and the central section. Because the external roof shell tends to expand whereas the internal ceiling shell tends to hold its size because it remains at room temperature, there is a tendency for the roof sections to thrust outward, downward, and to curl inward at the outward mid-wall joint (Fig. 6).[2] This, in turn, throws a horizontal and downward force upon the floor section where it meets the roof section at the mid-wall height. The result is a combination of thrusts and bending moments set up in the roof and floor sections which must be analyzed and allowed for. Furthermore, if the house is partially shaded, as it may be by trees, it is possible for one wing to reach the maximum temperature while the opposite wing is at a lower temperature. This sets up unbalanced expansion forces in the roof panels which may tend to cause twisting. All of this must be allowed for in the analysis of thrusts and forces within the structure, and the structure must be made adequate to withstand them without exhibiting any undue distortion or deformation.

General features of structure

In the engineering design of this house, every attempt was made to avoid putting any great amount of bending in the columns. From the architectural standpoint, the columns were to be as slender as possible.

Very early in the analysis it was decided that the cantilevers and the central floor section should be designed and built as one continuous unit. This idea was borrowed from the airplane designers, who carry the wing structure straight through the fuselage and avoid putting wing stresses into the fuselage. The wing is one big unit. Similarly, the floor and roof sections were designed as units so that the load is carried straight through and not transmitted to the columns to any great extent, except for the vertical load. The weight rests on the columns, but they are subjected to no lateral bending loads.

It was soon noticed that almost all designing was not for strength but for stiffness. Plastics materials, including reinforced plastic materials, have fairly low moduli of elasticity compared with. for example, such stiff materials as steel or aluminum. Steel has a modulus of 30 million and aluminum has a modulus of 10 million p.s.i.; reinforced plastics have moduli ranging all the way from a little over one million, as in an ordinary mat-reinforced material, through 2 to 2.5 million for fabric-reinforced materials, to a top of perhaps 4 to 5 million p.s.i. for oriented rods. In contrast, their strengths are in the same range as those of aluminum and structural steel. Consequently, the limiting factor in the design was stiffness rather than strength in almost every instance. To get this stiffness, the sections had to be made deep enough to have a large moment of inertia without using a tremendous quantity of expensive reinforced plastics. A box girder seemed to be the answer.

Floor and roof sections were therefore designed as large hollow girders (Fig. 3, p. 146) with their upper and lower surfaces subjected to longitudinal tension or compression, depending upon the magnitude and the direction of the loads imposed. The central core section had to be designed for thrusts carried through it in both directions; that is to say, from each pair of opposite wings. In addition, the roof shell had to be designed for transverse bending because of snow loads, and the floor similarly had to be designed for transverse bending because of floor loads. In the floor of the central core such bending occurs simultaneously in both directions together with the direct tensile and compressive forces set up by the thrusts from the attached wing floor and roof sections.

The construction of the roof calls, in addition, for four laminated perimeter or spandrel beams to which the roof and ceiling sections of the wing and core are fastened. In the case of the core floor, the concrete foundation wall takes the place of such peripheral or spandrel beams but it must be reinforced to resist the thrusts from the outboard wing sections.

With these analyses completed, it was next necessary to determine allowable stresses and the materials to be employed. The detailed analysis can then begin. This analysis and the testing of the prototype structure (a pair of full-size bents cantilevered on a frame that simulates the actual house foundation) will be discussed next month.

[2]This is perhaps more easily seen if the ceiling is thought of as contracting relative to the roof.—Ed.

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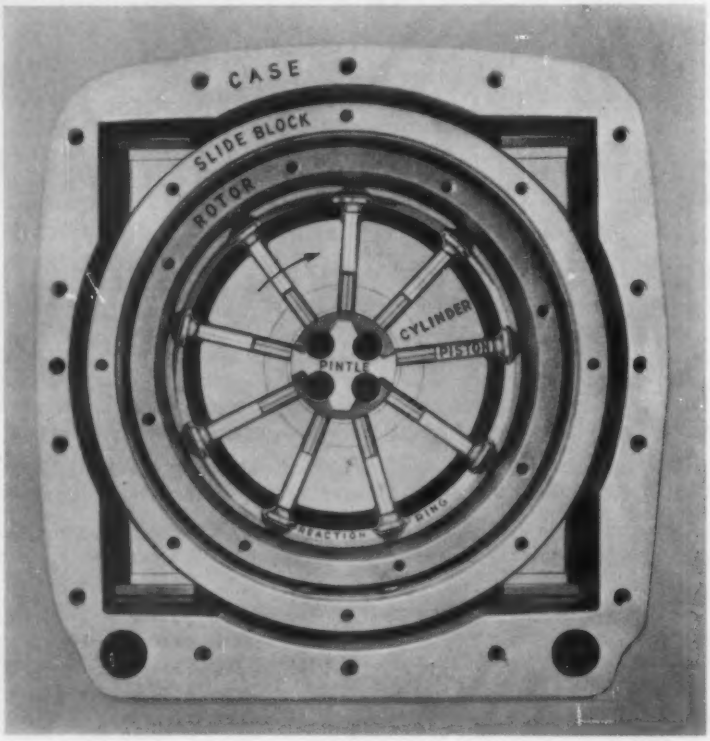
A personal survey of molders gave direction to the design of new maker's injection machines, resulted in important innovations in hydraulic system

About two years ago a group of men experienced in the design, operation, and selling of injection machines joined National Automatic Tool Co. with a determination to design and produce a superior injection molding machine. Although they came with ideas of their own on the subject, they decided to consult the molders. A list of 31 questions was prepared, and 20 of the leading molders in the Indiana-Ohio area, all of whom were operating eight or more machines, were personally interviewed. While these molders represent a somewhat different group than might be reached in a similar survey in the East (for example, this group operates very few machines in the 3-oz.-and-smaller class), their replies and comments are fairly representative of the U. S. injection industry.

Of the 31 questions, 22 were devoted to various machine features and points of construction. The last question is particularly significant: "What are some of the major problems you have with your present injection machines?" Troubles with the hydraulic system—oil leaks, pump failure, cracked clamp cylinders, loss of pressure—were overwhelmingly in the majority. Other complaints —"piping too inaccessible," "not designed for fast repair," "poor service on replacement parts"—also reflect trouble in the hydraulic system. A number of molders wanted considerably higher injection pressures than are commonly available, the figures ranging from 25,000 to 40,000 p.s.i. About half of them were using preplasticators, and even among those that had no preplasticating machines there were a number who were keenly aware of some advantages of preplasticating: bigger shots, faster cycles, strain-free parts, and better mixing.

The results of the survey reinforced an opinion that Natco engineers had arrived at through their own experiences: troubles with the hydraulic systems account for most of the unplanned down time on injection machines. They knew that conventional hydraulic systems, with their four-way valves and sudden shifts in pressure and direction of flow of the oil, were subject to great hydraulic shocks. These shocks, repeated in each cycle, inevitably cause fatigue of pipe and welded joints, bending of valve stems, cracking of clamping cylinders, and so on. The most unreasonable insistence of molders on higher speeds and higher pressures has only exaggerated the problem, with the result that most molders either have oil on their floors or have drip pans under their ma-

Fig. 1A: Reversing Oilgear pump in neutral; all nine pistons are equidistant from center of rotation and no oil is pumped. If slide block is shifted left, pistons at top are forced radially inward as cylinder turns, lower ones move radially outward. Oil is thus taken in at lower port, carried around and driven out through upper port. If slide is shifted right, action is reversed. (Diagrams, The Oilgear Co.)



chines. The drip pans, of course, offer the temptation of recovering and re-using the oil, contamination of which can hardly be avoided under such conditions. In addition, leaking oil presents a serious fire hazard.

New hydraulic system

The Natco hydraulic system has been designed to eliminate this damaging hydraulic shock. The heart of the system is a 40- or 75-hp. reversing Oilgear pump, a radial-piston pump (see Fig. 1A and 1B) in which the pistons are encased in a rotating housing whose lateral position with respect to the pistons can be adjusted by a small hydraulic pilot shifting control. The direction and degree of eccentricity determine the direction and amount of flow of oil through the pump. In the centered position shown in Fig. 1A, there is no radial motion of the pistons as the rotor turns, so no oil is pumped in either direction. But as the slide block is shifted right or left, with the pintle, cylinder, and drive shaft unmoving, the pistons oscillate radially, taking oil in at the lower ports and delivering it through the upper ports, or vice versa.

Reversal of either ram is accomplished by reversing the direction of flow of the oil (not the direction of rotation) through the pump. To do this the pump must pass through the neutral position, with the rate of flow continuously decreasing as the slide block approaches center, and increasing in the opposite direction as it moves into a position of opposite eccentricity. The result is an extremely smooth hydraulic action, free of the hammering so familiar in systems using four-way valves.

Since the large reversing pump serves both the clamping and injection rams, a flow diverter must be used. This is the "master control" of Figs. 2 to 5, and it is shifted only when the reversing pump is in its no-flow position. Clamp pressure is held during the injection stroke by a unidirectional, separately powered (7.5-hp.), auxiliary pump.

To get independent dual injection speed, slow mold breakaway, and slow ejection of the molded part, the displacement of the large reversing pump is adjusted by controlling the eccentricity. No metering valves are used. This results in simpler piping, less heat-up of oil, and good reproducibility of ram speed (important in uniformity of production).

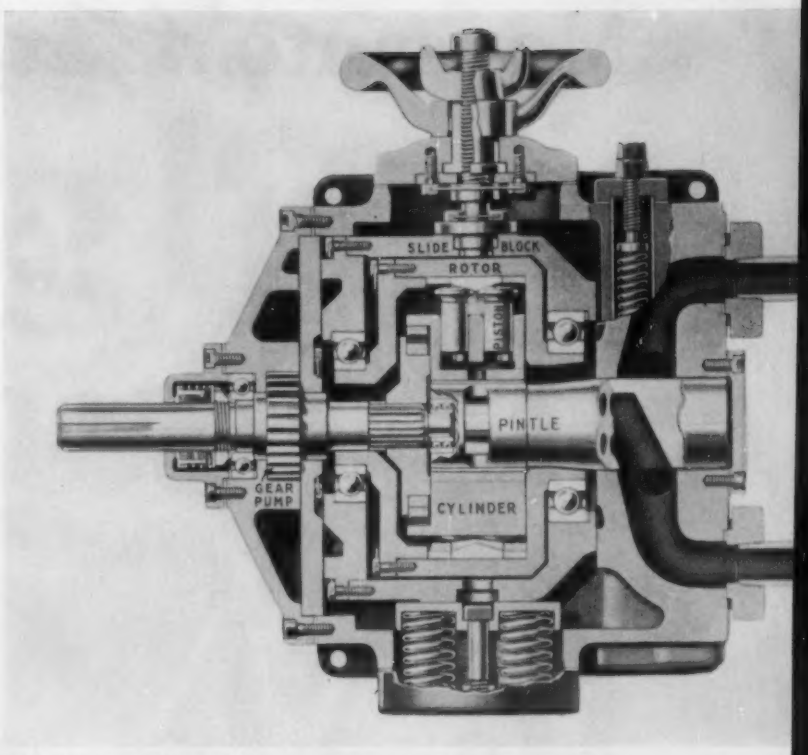


Fig. 1B: Horizontal mid-plane cut-away view of Oilgear variable-delivery, radial piston-type pump

The hydraulic cycle

Figures 2 through 5 are diagrams of the closed-circuit hydraulic system at various points in the molding cycle. Let's follow them through.

High speed closing of mold clamp. To secure high speed closing of the hydraulic mold clamp, it is desirable to prefill the main clamp cylinder with oil, eliminating the need of pumping oil to fill this large cylinder. This is accomplished by using a small stationary booster or jack ram. In Fig. 2, the large-capacity pump has been shifted to "A" position, pump delivery is from port "A," and pump suction is from the pullback area of the main clamp cylinder. The spool of the master control is positioned at "full left," permitting oil from the large pump to enter the axial hole in the booster ram, forcing the large clamp ram forward at a rapid rate. The prefill valve is open, allowing oil from the overhead tank to flow by gravity into the large clamp cylinder as the main clamp ram advances at rapid rate.

Just prior to mold contact, oil from the large-capacity pump is automatically admitted into the main clamp cylinder, reducing the closing speed of the main ram to eliminate mold slam. At this point of slow down (adjustable by electric limit switch position), the prefill valve is closed. Upon mold contact, the predetermined mold clamping force builds up in about 0.6 sec. through the combined output of both pumps. The large-capacity pump is then automatically shifted to neutral (no stroke—no pressure) position and the small one-way holding pump maintains the desired mold clamp pressure.

The clamping action of this ma-

(*To page* 156)

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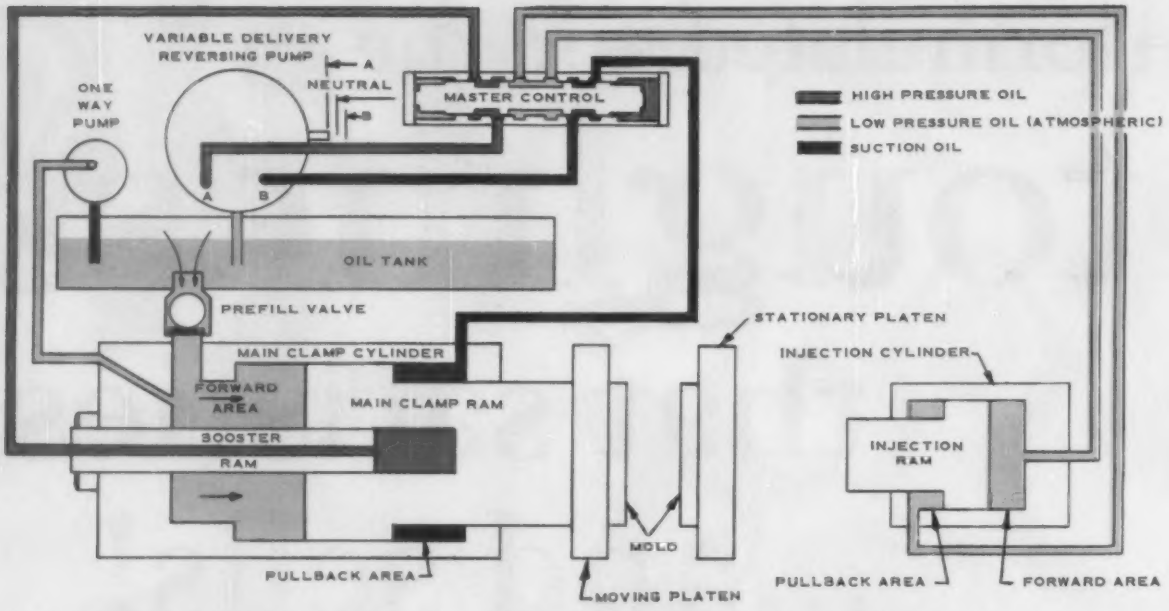


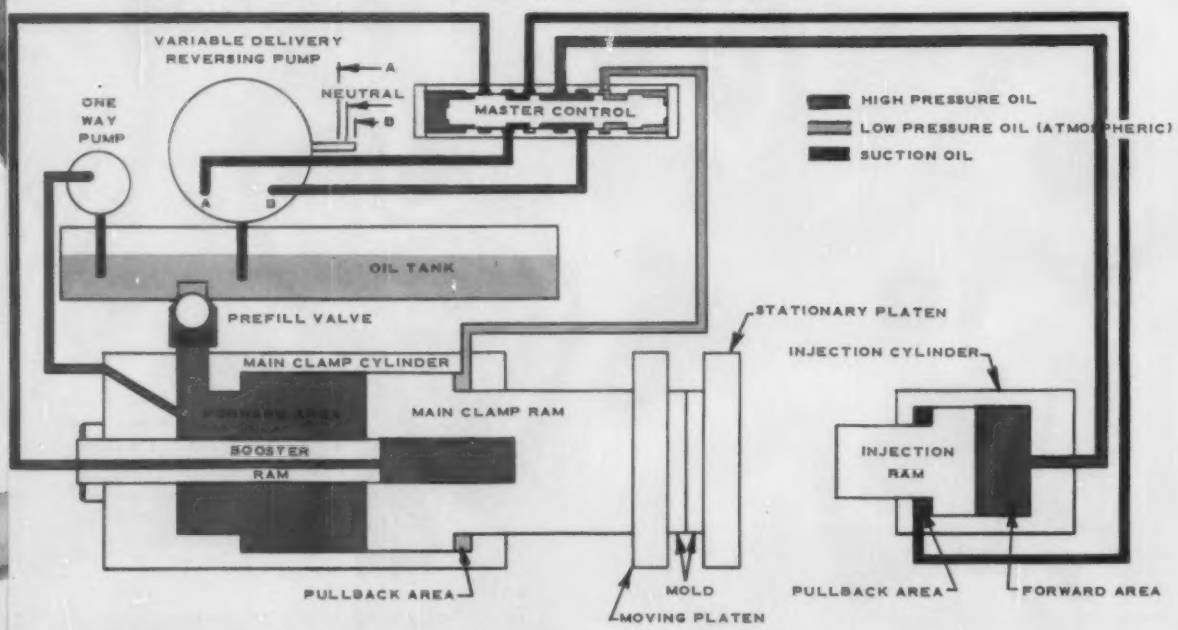
Fig. 2: Natco hydraulic system, with clamp in high-speed closing phase. (Diagrams, Natco)

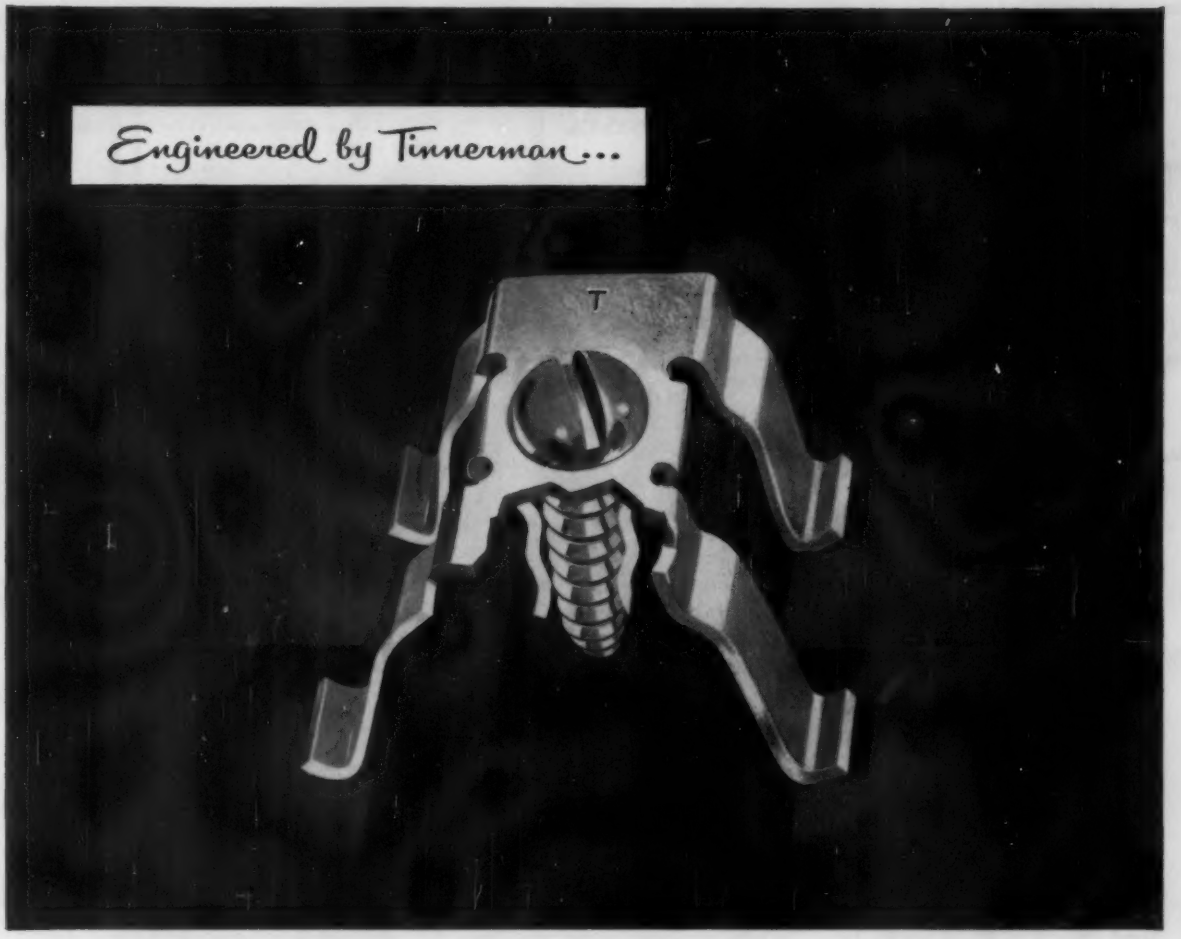
chine is also notable for its 26-in. stroke and high closing speed of 700 in./min. As much as 50 in. of daylight are available, and the stroke can be shortened if the full length is not needed. The time saved in closing and in clamp-pressure build-up, of course, means shorter cycles.

Injection ram advance. In Fig. 3 the master control has been shifted to "hard right" while the pump was in neutral position after mold clamp closing. Then the pump was shifted to its reverse position, so that delivery is now from port "B," while the pump suction is taken from the pullback area of the injection cylinder. Additional suction is secured direct from the oil tank.

When the pump was shifted, which required only a fraction of a second, the injection ram advanced at a rapid rate. At any position within the travel limits of the injection ram, it is possible to

Fig. 3: Pump is reversed, master control is shifted to right, and high-pressure oil goes to injection ram, causing it to advance. Small pump holds clamping pressure





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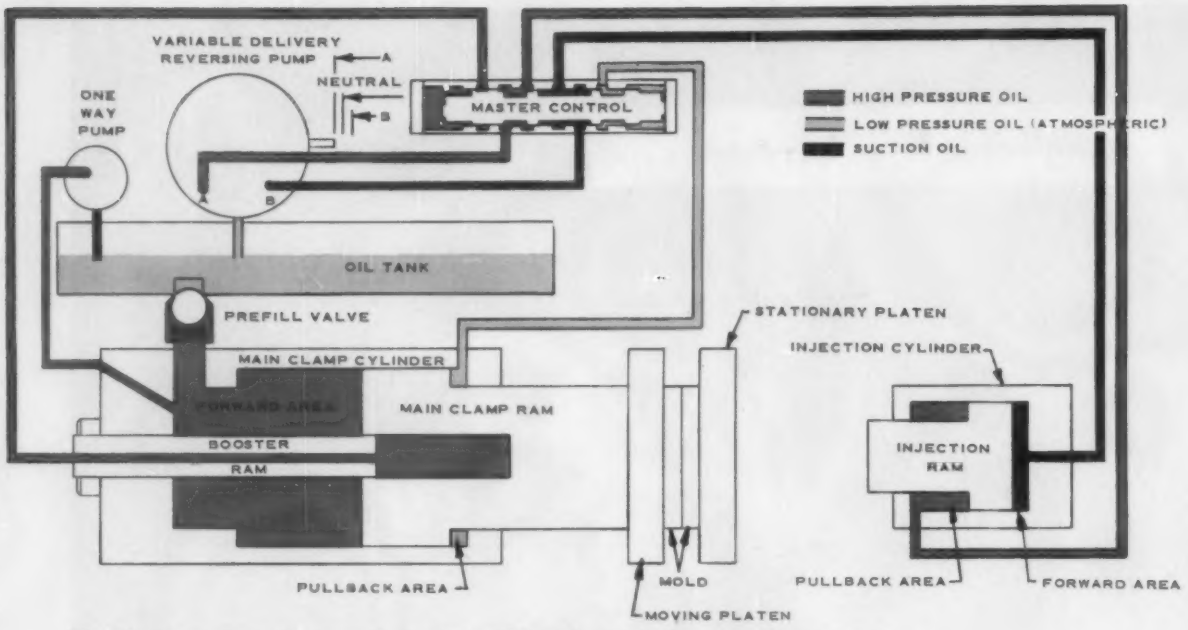


Fig. 4: Large pump is reversed, causing withdrawal of injection ram. Next stage is prepositioning of injection ram after feed shot enters cylinder. Taking up this motion during the cooling phase of cycle saves time later during injection stroke and cuts overall cycle time. This, of course, makes it necessary that the hydraulic system revert to the condition shown in Fig. 3. (Diagram, Natco)

retard the ram speed, providing, in succession, two distinct injection rates. This optional dual speed control is accomplished by shifting the large pump to partial stroke position, thereby reducing the output of the pump. Both speeds have infinite adjustment within their range.

Injection ram return. Note in Fig. 4 that only the pump is reversed in returning the injection ram, causing delivery to be changed to "A" port and admitting oil under pressure to the pullback area of the injection cylinder, thereby retracting the injection ram. Pump suction is secured from the forward area of the injection cylinder. There is no change in the position of the master control. There can be no reversing shock, because at point of reversal, the large pump is pumping no oil and there is no pressure.

The mold clamp ram remains closed, the clamp pressure being maintained by the small clamp-holding pump.

Prepositioning of injection ram. Approximately one-half of the forward stroke of the injection ram is idle "material feed" movement required to advance the injection plunger beyond the feed slot. It saves cycle time if this slack is taken up while the previously injected part is cooling in the mold.

This prepositioning is accomplished by simply reversing the output of the large pump. There is no movement of the master control and the circuit situation is the same as during injection (Fig. 3, p. 156).

The injection ram advances to the "cutoff" point which is controlled by limit-switch position. The pump then shifts to its neutral position, stopping the injection ram movement. At this time, the master control shifts to "hard left" position in preparation for opening the mold clamp.

Mold clamp opening. After the clamp timer has "timed out," oil in the main cylinder is decompressed, the prefill valve is opened, and the big pump is shifted on stroke, delivering oil under pressure from port "B" to pullback area of the clamp ram cylinder (Fig. 5, p. 160). The large clamp ram retracts slowly, since the pump is only on partial stroke. This slow mold breakaway protects molded parts from fracturing during mold separation.

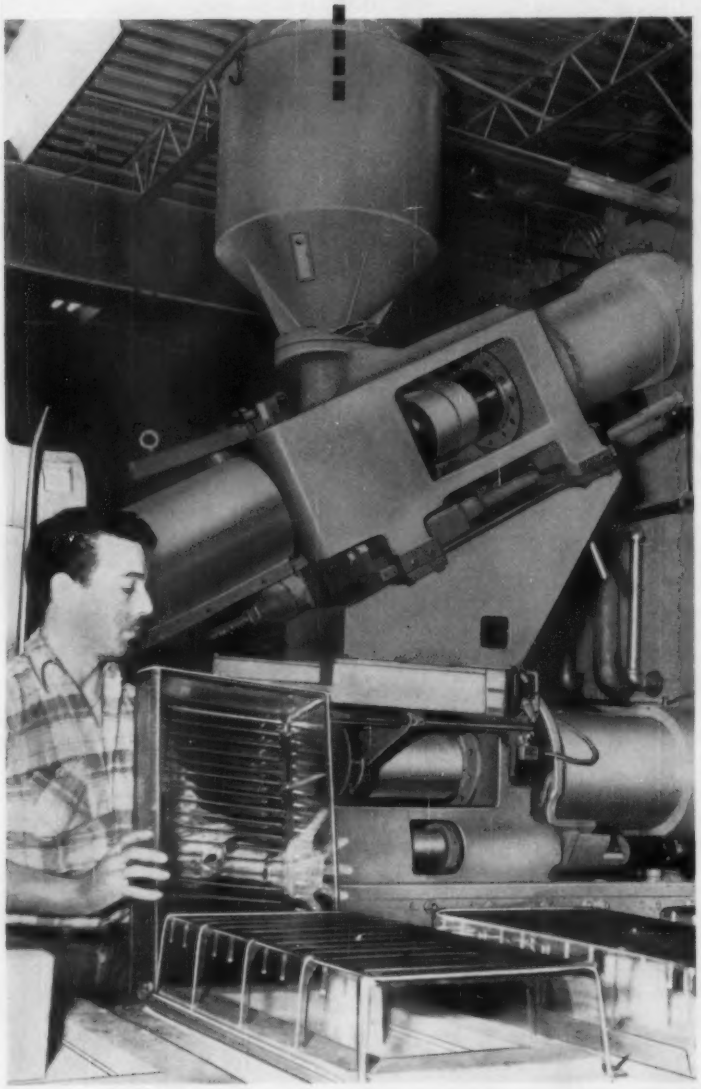
At a predetermined position of the main ram, the big pump is shifted to full stroke and the main ram retracts at a rapid rate. Just prior to ejection of the molded parts, the pump is again automatically shifted to partial stroke position, retarding the clamp ram action to permit ejection of the parts without damage. At the end of the ejection stroke, the pump is shifted automatically to neutral position, stopping the ram movement, thereby completing one full cycle of the machine.

The total length of this cycle, when there is no molding material in the machine—the so-called dry-cycle time—ranges from 5.5 to 6.5 sec., depending on length of the clamping stroke and whether or not there is a prepacking stage. This is claimed to be the fastest cycling machine of its capacity ever developed.

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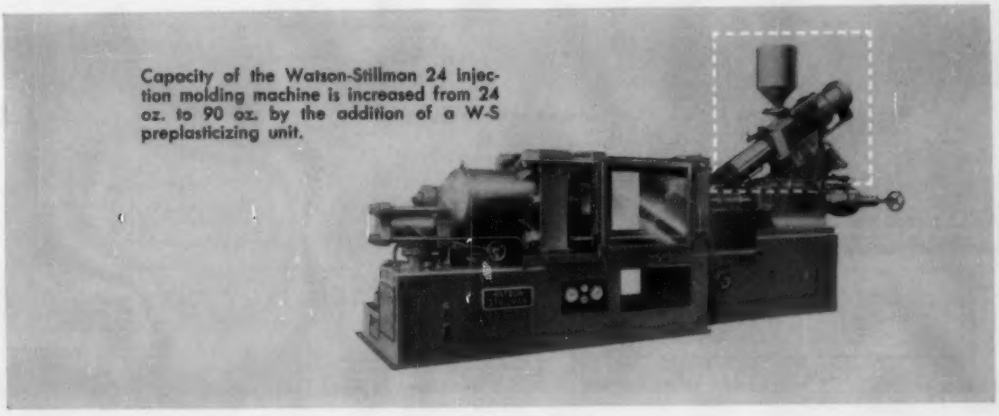
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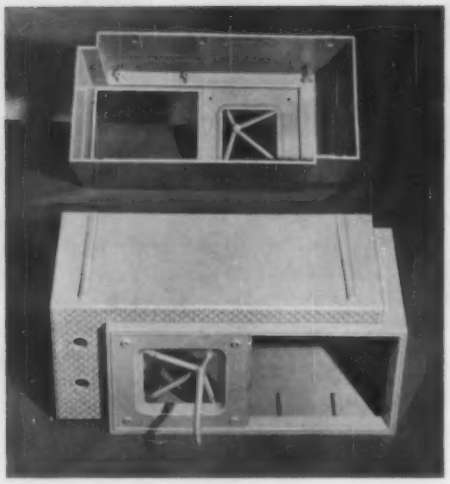
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WS-33



Capacity of the Watson-Stillman 24 injection molding machine is increased from 24 oz. to 90 oz. by the addition of a W-S preplasticizing unit.



Front and rear views of radio cabinet molded on Natco Model 400 from polystyrene. Note gating designed to provide even fill of sharp-cornered sections containing several thick bosses. Syntron vibrating feeder gives shot-weight reproducibility almost equal to that of weight feeder: in 10 successive shots of this cabinet weights ranged from 21.56 to 21.59 oz., a variation of less than 0.2 percent

of the schematic circuit drawings indicates that to operate either mold clamp or injection unit independently requires only the big pump to be reversed. For example, the clamp ram can be advanced and retracted simply by shifting the pump delivery from "A" to "B". The master control is not shifted.

When installing molds, clamp ram can be advanced and retracted at a very slow rate. On advance, full pump delivery is directed against the combined areas of the main clamp and clamp booster rams (no prefill). On clamp return, the pump is shifted to partial stroke position, thereby providing slow retraction. These smooth slow speeds are ideal for setting molds.

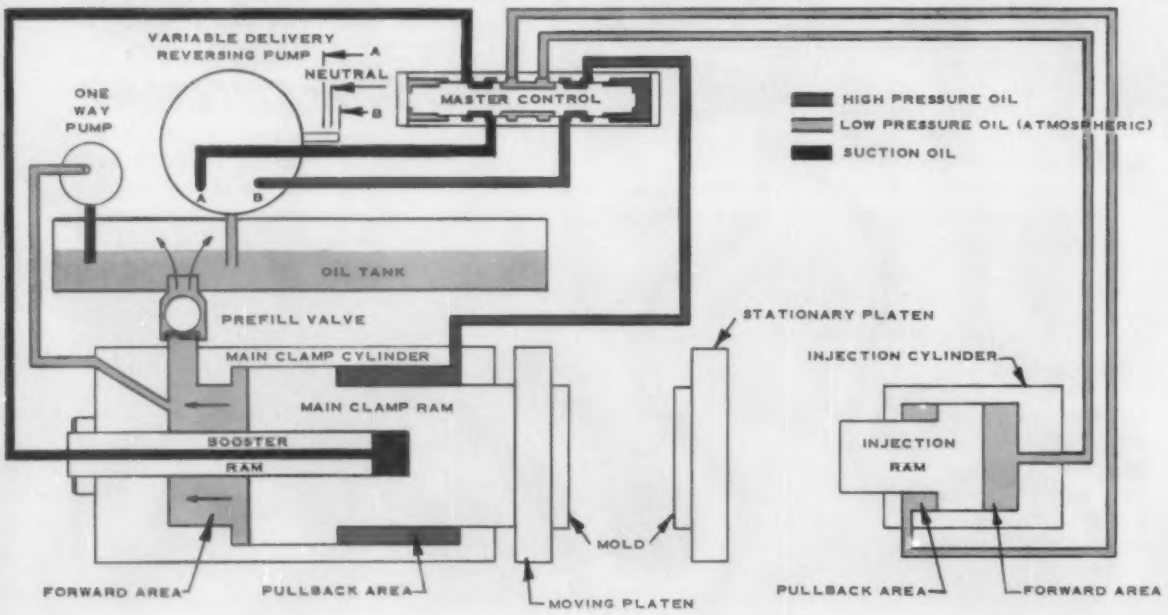
Manual, independent injection ram action is used principally in purging the heating chamber during material or color change. Injection ram action is secured by simply shifting delivery of the big pump from "B" port to "A" port; the master control does not shift.

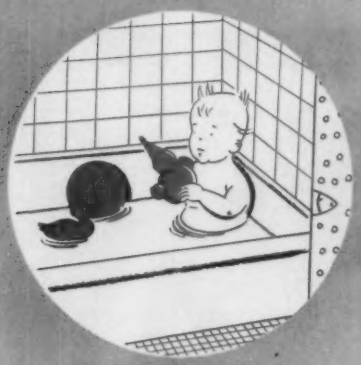
Another feature of this hydraulic system that will appeal to molders is this: the hydraulic components are located overhead, well above the dirt and traffic of the molding room (see photo, p. 244). The machine base is nothing but a base—nothing is inside it.

The system and the injection end of the machine have been designed to incorporate, when it becomes available, an in-line preplasticator. The entire injection unit can be hydraulically retracted to gain access to the rear of the mold sprue bushing, and this retractability required that the cylinder be connected to the pump by either high-pressure rubber hose, a slip joint, or a swing joint. On this particular point the molders surveyed were almost unanimous: they liked rubber hose. Natco engineers, however, felt that hose presents a serious safety hazard. If the hose fails, the oil squirts out at high speed; if it strikes the hot cylinder, a very destructive fire results. They therefore used the much safer (if historically more pesky) slip joint.

A description of the other features of this new molding machine, and its performance specifications, will be found in the New Machinery and Equipment section, p. 242.

Fig. 5: Master control is shifted to left and pump reversed to open mold, ending cycle. (Diagram, Natco)





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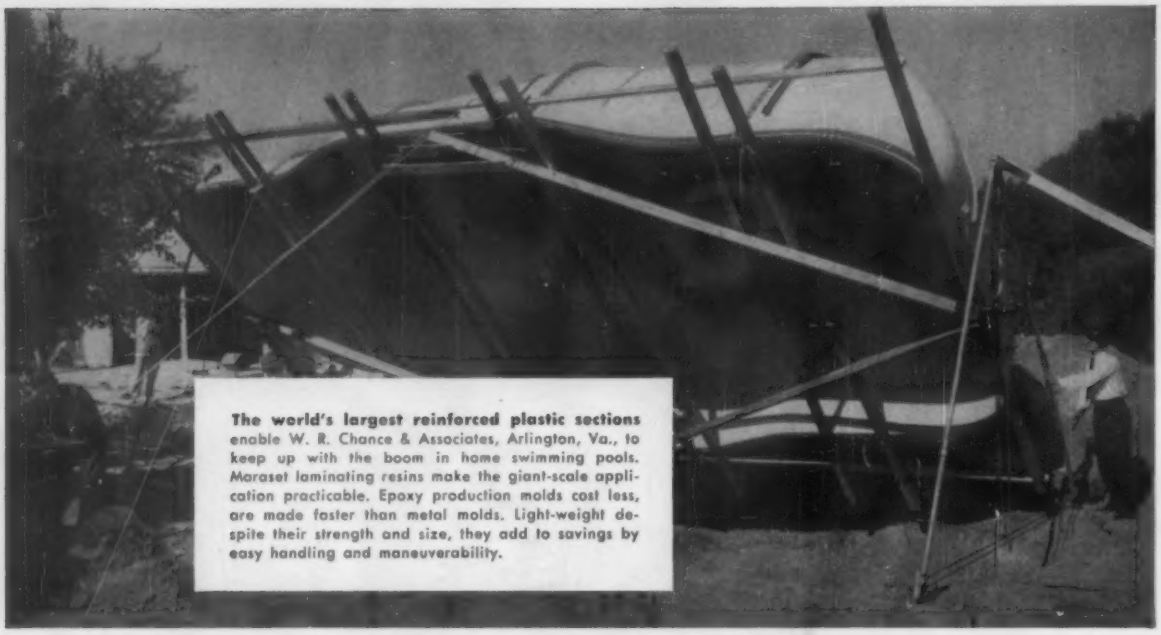
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Plastics Technical Section

Dr. Gordon M. Kline, Technical Editor

Fatigue properties *of fibrous glass-reinforced plastics laminates subjected to various conditions*

By Kenneth H. Boller†

Fatigue strength values are presented for 6 standard and 4 heat-resistant resin laminates reinforced with glass fibers. Fifty-three S-N curves, representing fatigue data between 1 thousand and 10 million cycles, show the effect on fatigue strength of notching, moisture, fabrics, resins, mean stress levels, angles to warp, and temperatures up to 500° F.

Since fibrous glass-reinforced plastic laminates are continually being developed for structural use in aircraft and power plants, it is essential that the factors affecting their strength be evaluated for the designers. A considerable amount of data is available on the static strength properties of structural plastics under standard conditions(1)[1] and some data are available on their fatigue strength at room temperatures(2, 3). However, available fatigue data at elevated temperatures are limited. To fill this gap in the knowledge of factors affecting the strength of reinforced plastics that are to be used under adverse conditions, the fatigue properties of typical heat-resistant plastic laminates were investigated at both room and elevated temperatures at the U. S. Forest Products Laboratory in cooperation with Wright Air Development Center.

The fatigue data were obtained on axially loaded specimens from 10 types of laminates which were molded in flat sheets. Each of these 10 types of laminates was made with one of six types of resin and one of five types of fibrous glass reinforcement. The effects of the following conditions were investigated: 1) stress concentration, 2) moisture, 3) temperature, 4) direction of loading, 5) various levels of mean stress, and 6) types of fabric reinforcement.

The stress concentration was produced by a ⅛-in.-diameter hole in the center of the specimen. Moisture effects were produced by conditioning the material at 100° F. and 100% relative humidity for not less than 30 days prior to testing at that condition. The effects of temperature were investigated at 73, 300, and 500° F. during the test period. Since the test material was in flat sheets, the specimens were loaded axially in the plane of the sheet at 0° and 45° to the warp at a test frequency of 900 cycles per minute. Various alternating stresses were superimposed on various tensile mean stresses. The complete relationship between alternating stress and mean stress with respect to time was clarified by stress-rupture data supplied by Wright Air Development Center on matched material. A total of 53 S-N curves were obtained, each covering a range of 1000 to 10 million cycles.

Description of materials

Flat, fibrous glass-reinforced panels approximately ¼ in. thick were made or procured by the U. S. Forest Products Laboratory. The size and number of panels of each type of laminate varied with the number of tests required for that particular laminate. The specifications for the materials were supplied by Wright Air Development Center.

Of the 10 laminates under investigation, four were made with heat-resistant resins: 1) polyester resin (PDL-7-669), 2) epoxy resin (Epon X12100), 3) phenolic resin (BV 17085), and 4) silicone resin (DC 2106). All of these heat-resistant laminates were reinforced with 181 glass fabric, Volan A finish, except the silicone laminate, which was made with heat-cleaned 181 glass fabric. The other six laminates were in the standard class. One of these was made with an epoxy resin (Epon 828 CL), and the remaining five

*Reg. U.S. Pat. Off.

Presented at the annual meeting of the Reinforced Plastics Div., Society of the Plastics Industry, February 1957.

†Engineer, Forest Products Laboratory, Forest Service, U.S. Dept. of Agriculture, maintained at Madison, Wis., in cooperation with the University of Wisconsin.

[1]Numbers in parentheses link to references at end of article, p. 293.

Table I: Fabrication data for glass-reinforced plastic laminates

Type of resin	Reinforcement: Type	Reinforcement: Finish	Number of plies	Pressure	Temperature	Time of cure	Manufacturer
				p.s.i.	° F.	min.	
Polyester (Paraplex P43)	181	Volan A	23	14	220-250	90	Forest Products Laboratory
Polyester (Paraplex P43)	112	"	84	14	220-250	90	"
Polyester (Paraplex P43)	120	"	64	14	220-250	90	"
Polyester (Paraplex P43)	184	"	10	14	220-250	90	"
Polyester (Paraplex P43)	Mat	—	7	14	220-250	90	"
Epoxy (Epon 828-14% CL)	181	Volan A	24	0	212	10	Shell Development Co.
				50	212	25	
				0	400	120	
Polyester (PDL 7-669)	181	"	23	14	220	45	Forest Products Laboratory
				0	500	180	
Epoxy (Epon X12100-4% E)	181	"	24	0	310	3	Shell Development Co.
				200	310	42	
				0	400	1440	
Phenolic (BV 17085)	181	"	—	—	—	—	Swedlow
Silicone (DC 2106)	181	Heat cleaned	28	—	—	—	Dow-Corning

were made with a polyester resin (Paraplex P43). The standard epoxy laminate was reinforced with 181 glass fabric, and the polyester laminates were reinforced with 181, 112, 120, and 184 glass fabric and a 1½-oz. glass mat. All the woven fabrics had Volan A finish. All of the fabric laminates were parallel-laminated.

The methods used to make the panels at the U. S. Forest Products Laboratory are shown in Table I, above. The methods used for the other panels are not specifically known, but the laminates did meet the established strength requirements.

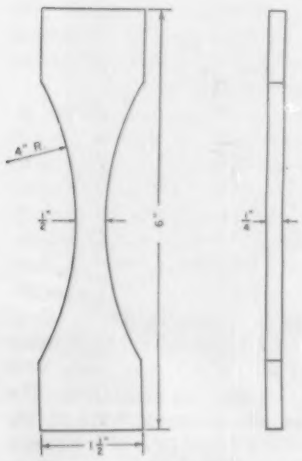


Fig. 1: Sketch of fatigue specimen used in tests

The quality of the laminates, as measured by their physical properties and static strength in tension, compression, and flexure, is shown in Table II, p. 166. Values reported in this table were obtained in accordance with Federal Specification L-P-406b. The standard laminates had properties that exceeded the minimum requirements of parallel-laminated, ⅛-in.-thick stock, as stipulated in Specification MIL-P-8013A, except that the maximum tensile stress at room temperature for the polyester laminate with mat reinforcement was below the specification requirement.

Scope of fatigue test program

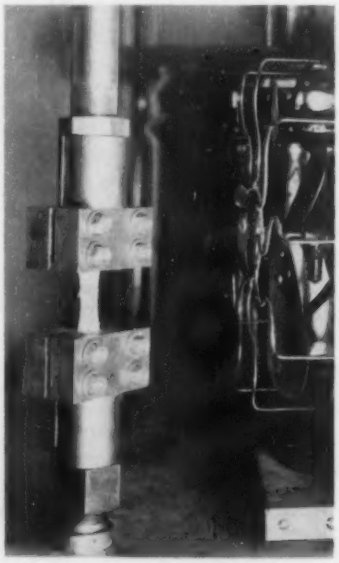
The effects of notching, moisture, direction of loading, magnitude of mean stress, and temperature on the fatigue characteristics of the 10 materials were evaluated in this test program. All combinations of variables and materials were not investigated, however. The specific variables that were investigated for each material are shown in Table III, p. 168. In addition to the S-N curves obtained at the Laboratory, six stress-rupture curves were obtained by Wright Air Development Center. They were for notched and unnotched specimens of the heat-resistant polyester laminate tested at 73° F. and 50% relative humidity, 300° F., and 500° F.

Test Specimens

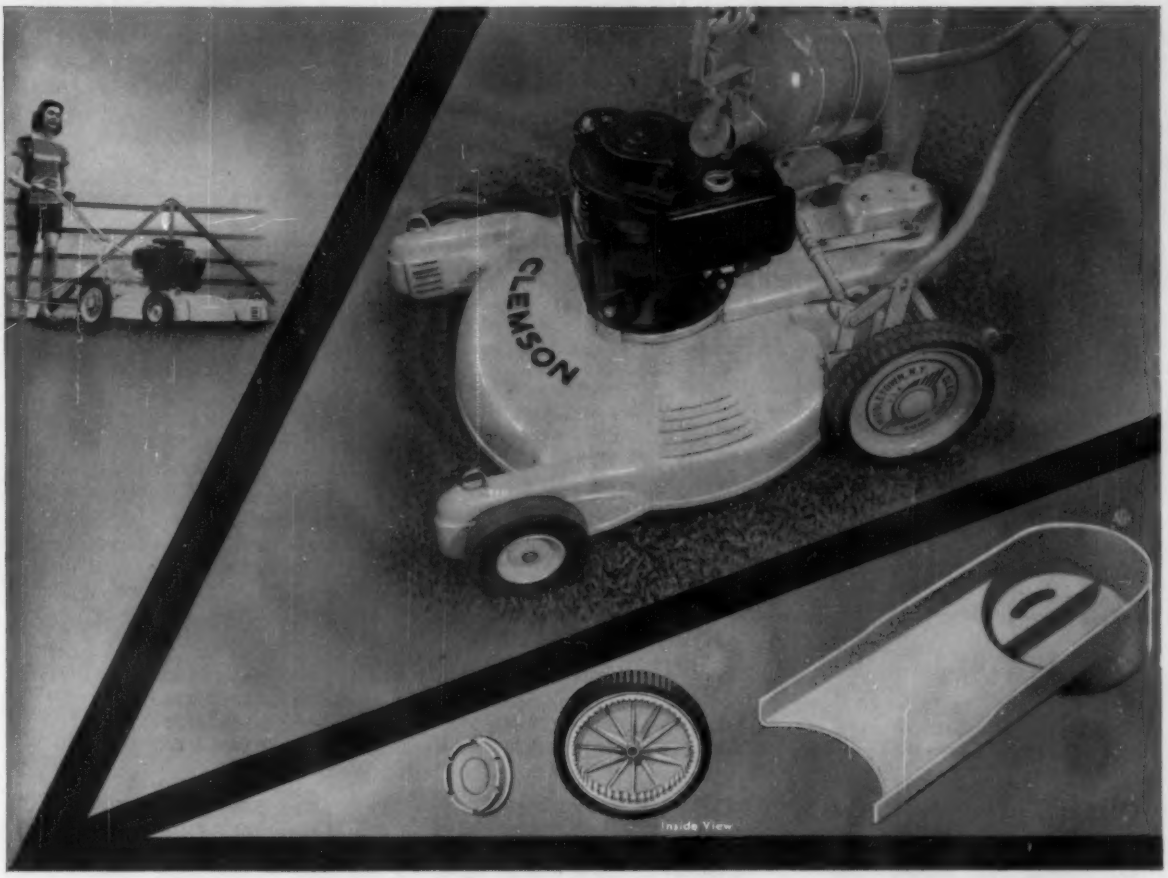
Unnotched: The type of fatigue specimen used in this investigation is shown in Fig. 1, below. The specimen was gripped by the clamps shown in Fig. 2, below, so that it had an unsupported length of 2¼ inches. The ratio of this length to the thickness was about 9, which was sufficiently small to prevent buckling during the compression cycle of the fatigue tests.

Notched: The notched fatigue specimens were the same size and shape as the unnotched specimens. The notch, or stress concentration, was a hole ⅛ in. in diameter at the center of the specimen. Theoretically, the stress at the edge of

Fig. 2: Close-up of grips supporting fatigue specimen loaded axially in tension and compression in a direct-stress fatigue machine. Fan is used to remove heat generated in net section of specimen by continuously blowing air past it



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this centrally located notch was 3½ times the average stress. However, the actual effect of the notch and the 4-in. radius used to reduce the width, as shown by data in the previous report(2), was a reduction in average stress of 20 to 28% in tension and an increase in average stress of 6 to 20% in compression.

Smooth cuts along the edges of the specimens were made with a carborundum saw for the straight cuts or with a small emery wheel mounted in the plane of the sheet for the curved cuts. The ⅛-in. hole was drilled with a steel drill and was not polished.

Stress rupture: These specimens, which were subjected to a steady stress without a superimposed alternating stress, were necked down like the fatigue specimens. These constant-load specimens were the same as the fatigue specimens, except that their over-all length was 20 in. instead of 6 and their width was 1¼ in. instead of 1½; ¾ in. from each end, a hole ⅜ in. in diameter was drilled for use in applying the load to the specimen. The areas around the holes at the ends of

Table II: Physical properties of glass-reinforced plastic laminates

Property	Composition of laminates[a]									
	Polyester + 181 fabric	Polyester + 112 fabric	Polyester + 120 fabric	Polyester + 184 fabric	Polyester + mat	Epoxy + 181 fabric	TAC polyester + 181 fabric	Heat-resistant epoxy + 181 fabric	Heat-resistant phenolic + 181 fabric	Silicone + 181 fabric
Resin content, %	34.3	37.8	38.6	29.5	58.3	37.7	35.3	35.0	28.0	31.0
Specific gravity	1.87	1.74	1.79	1.88	1.44	1.80	1.90	1.87	1.92	1.85
Average thickness, in.	0.233	0.223	0.246	0.261	0.234	0.247	0.222	0.221	0.257	0.261
Barcol hardness	70	73	72	70	59	71	74	74	81	63
Moisture absorption[b], %	0.09	0.06	0.08	0.14	0.28	0.11	2.81	0.10	0.32	0.21
Tensile properties (73° F.-50% R.H.)										
Modulus of elasticity, 10^6 p.s.i.	3.23	2.87	2.94	3.18	1.10	3.04	2.65	2.81	3.46	2.64
Proportional limit stress, 10^3 p.s.i.	9.45	11.67	12.98	9.85	5.17	16.28	18.05	13.84	12.77	20.95
Maximum stress, 10^3 p.s.i.	52.22	46.26	45.66	50.26	11.95	48.95	46.19	42.58	47.88	37.70
Maximum stress required, 10^3 p.s.i.	40.00	40.00	40.00	43.00	20.00	40.00	32.00	38.00	40.00	20.00
Compressive properties (73° F.-50% R.H.)										
Modulus of elasticity, 10^6 p.s.i.	3.57	3.19	3.29	3.56	1.24	3.22	3.08	3.54	3.93	2.80
Proportional limit stress, 10^3 p.s.i.	23.15	24.52	26.90	15.99	10.54	27.82	26.66	22.57	24.23	13.35
Maximum stress, 10^3 p.s.i.	43.48	45.18	43.48	32.28	23.18	58.47	37.72	49.33	54.65	22.80
Maximum stress required, 10^3 p.s.i.	35.00	33.00	33.00	26.00	20.00	35.00	37.00	50.00	22.00	18.00
Flexural properties(73° F.-50% R.H.)										
Modulus of elasticity, 10^6 p.s.i.	3.45	3.08	3.23	3.32	1.33	3.02	3.16	3.08	3.68	2.92
Fiber stress at proportional limit, 10^3 p.s.i.	23.05	24.56	26.76	23.23	9.16	27.17	38.60	27.54	38.48	16.59
Modulus of rupture, 10^3 p.s.i.	66.92	63.52	62.18	56.32	23.60	65.63	51.30	61.57	71.01	32.66
Modulus of rupture required, 10^3 p.s.i.	50.00	50.00	50.00	45.00	25.00	50.00	35.00	60.00	50.00	25.00
Flexural properties (73° F.-wet, after 2-hr. boil)										
Modulus of elasticity, 10^6 p.s.i.	3.07	2.78	2.78	3.00	1.02	2.92	2.78	3.00	3.60	2.91
Fiber stress at proportional limit, 10^3 p.s.i.	23.60	25.56	26.26	21.46	7.25	32.93	33.90	33.55	32.19	13.49
Modulus of rupture, 10^3 p.s.i.	54.80	51.86	52.92	47.74	21.76	64.00	41.80	61.27	66.93	23.66
Modulus of rupture required, 10^3 p.s.i.	45.00	45.00	45.00	40.00	20.00	45.00	—	—	—	—
Flexural strength (at 500° F. after ½ hr.)										
Modulus of elasticity, 10^6 p.s.i.							2.39	2.33	2.42	2.13
Fiber stress at proportional limit, 10^3 p.s.i.	These laminates are not heat resistant						19.30	15.04	17.88	6.05
Modulus of rupture, 10^3 p.s.i.							27.30	18.71	29.36	11.53
Modulus of rupture required, 10^3 p.s.i.							30.00	40.00	40.00	12.00
Flexural strength (at 500° F. after 200 hr.)										
Modulus of elasticity, 10^6 p.s.i.							2.04	2.13	1.28	2.38
Fiber stress at proportional limit, 10^3 p.s.i.	These laminates are not heat resistant						4.46	9.79	1.88	6.52
Modulus of rupture, 10^3 p.s.i.							5.98	16.81	3.56	15.45
Modulus of rupture required, 10^3 p.s.i.							10.00	5.00	5.00	12.00

[a] All fabrics with Volan A finish
[b] After 24 hr. in water

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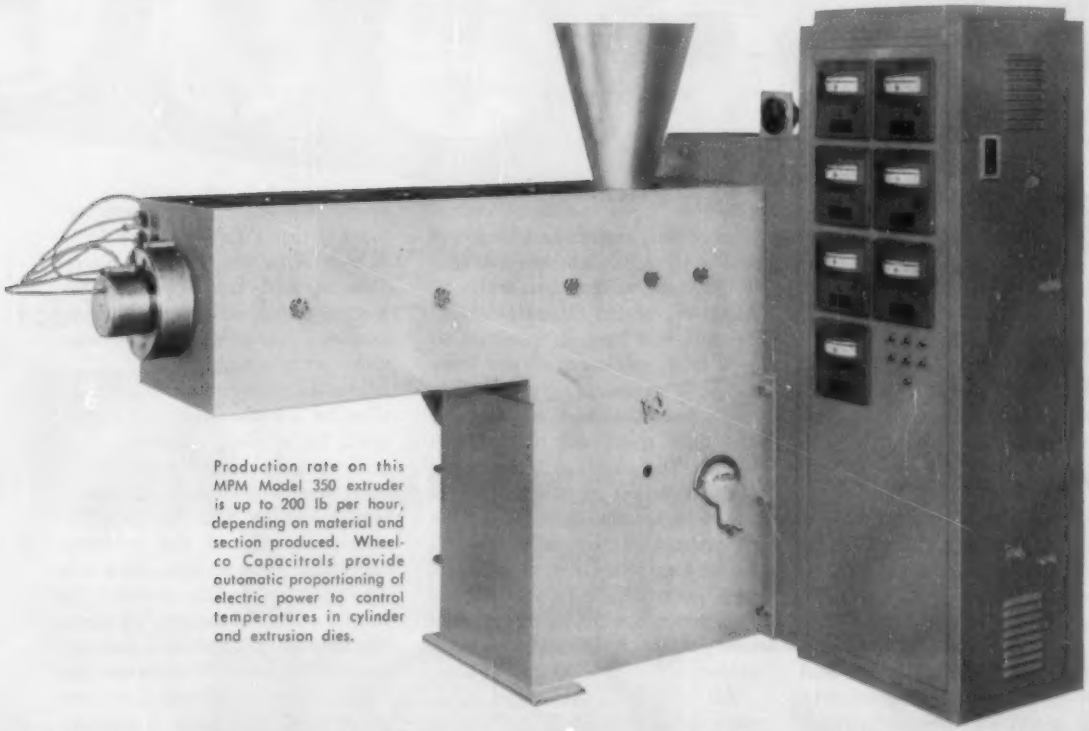
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Table III: Scope of test program for fatigue studies of glass-reinforced plastic laminates

Laminates		Mean stress level	Test conditions											
			Room temperature					Elevated temperature						
			73° F., 50% relative humidity			100° F., 100% relative humidity		300° F.			500° F.			
Resin	Fabric		0° to warp	0° to warp	45° to warp	0° to warp	0° to warp	0° to warp	0° to warp	45° to warp	0° to warp	0° to warp	45° to warp
			Unnotched	Notched	Unnotched	Unnotched	Notched	Unnotched	Notched	Unnotched	Unnotched	Notched	Unnotched
Room-temperature laminates													
Polyester	181	0	X			X							
Polyester	112	0	X	X									
Polyester	120	0	X	X									
Polyester	184	0	X	X									
Polyester	mat	0	X	X									
Epoxy	181	0	X	X		X	X						
Heat-resistant laminates													
Polyester	181	0	X	X	X			X	X	X	X	X	X
Polyester	181	1/5	X	X				X	X		X	X	
Polyester	181	1/2	X	X				X	X		X	X	
Epoxy	181	0	X	X				X	X		X	X	
Phenolic	181	0	X	X				X	X		X	X	
Silicone	181	0	X	X				X	X		X	X	

the specimens were reinforced with 1¼- by 2- by 0.041-in. aluminum plates that were bonded to the specimens with Epon VI metal adhesive. This measure was taken because failures were occurring at these holes in both notched and unnotched specimens at room and elevated temperatures.

Test method and equipment

After the quality of the materials had been determined by standard methods of test, 10 specimens for fatigue tests and five specimens for static tests of ultimate tensile strength were cut from each material. Thus, a total of 15 basic matched specimens were available for each S-N curve. Some compression control tests were made on heat-resistant laminates. The control specimens were tested in a universal testing machine under the same conditions of temperature and humidity that were to be maintained during fatigue tests on the same material. After the static ultimate tensile strength had been determined on a fatigue specimen of one material, alternating stress amplitudes were assigned to the series of fatigue specimens of that material. The highest alternating stress assigned was about 70% of the static tensile strength, and the percentage was decreased on subsequent specimens until a specimen endured 10 million cycles. This procedure provided test data between about 1000 and 10 million cycles.

All of the fatigue specimens were axially loaded by fatigue machines of the type shown in Fig. 3, p. 170. To have the specimen truly axially loaded without torsion or bending distortion, the upper and lower grips were rotated to bring the stationary faces of both grips into the same plane. Tension and compression loads were applied alternately by an eccentric operating at 900 revolutions per minute.

The static load that was first applied to the specimen was measured by a dial mounted on a calibrated dial bar. The dial measured the deflection of the horizontal loading arm between the connecting rod of the eccentric and the loading screws. Since this static load took into account the inertia effects of the moving parts, the desired dynamic load was applied during test. The factors for this increase of dynamic load over static load had been previously measured electronically. The desired dynamic load was kept constant throughout the test by periodic checks, followed by ad-

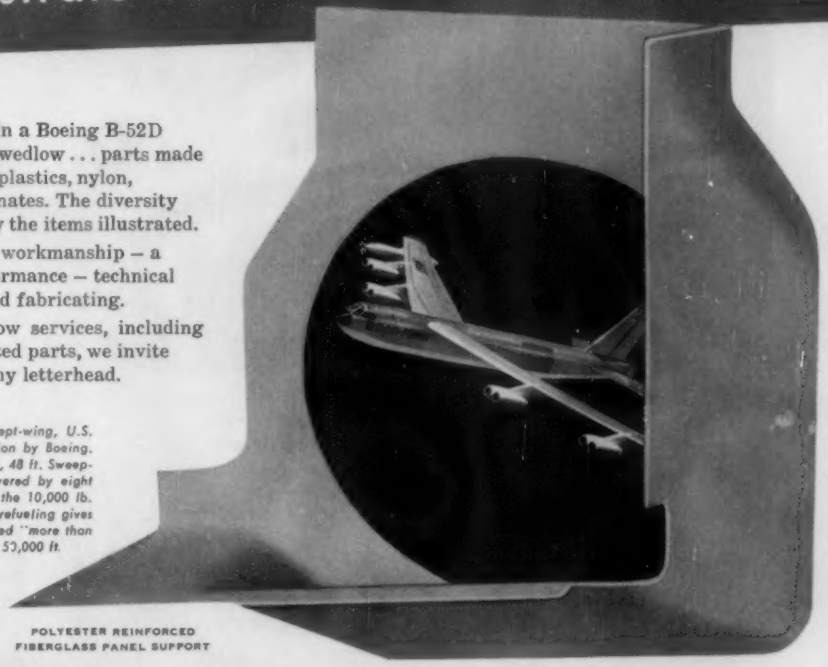
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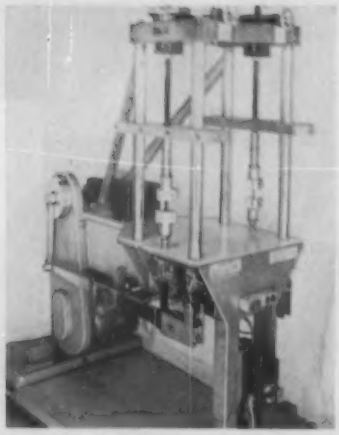


Fig. 3: Direct-stress fatigue machine, with specimens shown under test. Specimens are held in specially designed grips in order to permit both tensile and compressive loading

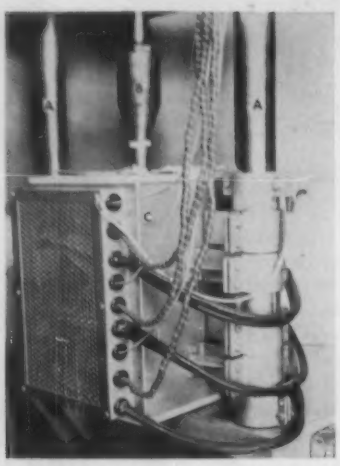


Fig. 4: View of fatigue machine and electric oven for tests at elevated temperatures: A—columns of machine; B—upper loading screw; C—electric oven

justments when necessary. An electronic shut-off mechanism on the horizontal loading arm stopped the test if the tensile load dropped more than 25 lb. Then, if failure had not occurred at a shut-off, load adjustments were made, and the test was continued.

For normal room-temperature tests, one testing machine was operated in a room maintained at 73° F. and 30% relative humidity. Heat generated in the net section of the specimen was removed by a 12-in. fan that continuously blew air past the specimen. For elevated temperature tests, two machines were equipped with ovens (Fig. 4, above) capable of heating the specimen and its clamps to 1000° F. and maintaining the desired temperature to ± 5° F. The ovens were split in the center in a vertical plane, and each half could be rotated on a hinge at the vertical post of the fatigue machine, so that the fatigue specimens were accessible. The heating elements in the ovens were divided into three zones, each of which was regulated by a rheostat, which was in turn regulated by a thermocouple. The thermocouple was taped to the specimen at the net section, so that the temperature rise due to the heat generated in the specimen during the test was considered as part of the total temperature upon which control of oven temperature was based. The temperature of the air between the heating coils and the specimen was thus somewhat less than the established test temperature. Each fatigue specimen to be tested at 300 or 500° F. was installed in a comparatively cool oven. After installation, it required about 1 hr. for the specimen, its fittings, and the loading screws to reach temperature equilibrium. The specimen was then loaded and tested.

A wet condition of 100° F. and 100% relative humidity was provided by special humidity chambers. For preliminary conditioning, a small metal box with a rack for holding the specimens above water was placed in an oven at 100° F. The fatigue specimens were exposed in this manner for at least 30 days before they were tested. In the fatigue machine, they were tested in another chamber attached to the loading screws (Fig. 5, right). This chamber was a cylinder with rubber sides and tin ends. A rubber hose carried moisture-laden air from a generator to the specimen. The generator, which was a tank filled with water heated by thermostatically controlled electric elements, combined air and water so that air at the fatigue specimen would be at 100° F. and 100% relative humidity. Compressed air bubbled up through the warm water and picked up moisture and heat. Heat losses through the rubber hose were taken into account, so that the air delivered to the specimen was at the desired condition.

Stress-rupture test specimens of the size and shape indicated earlier were supplied to the Wright Air Development Center, where stress-rupture tests were made in tension on apparatus at the Materials Laboratory, Wright-Patterson Air Force Base, Ohio. They used the creep testing machines and ovens normally used for testing metals to test the modified fatigue specimens. The bearing holes at the ends of these modified specimens were reinforced with aluminum plates to prevent premature failure during load application.

Fatigue test data

The results of individual fatigue and stress-rupture tests were plotted on semilogarithmic coordinates, with the stress plotted as ordinate on a uniform scale and the number of cycles, or time, as abscissa on the log scale. A typical plot of fatigue data, presented as

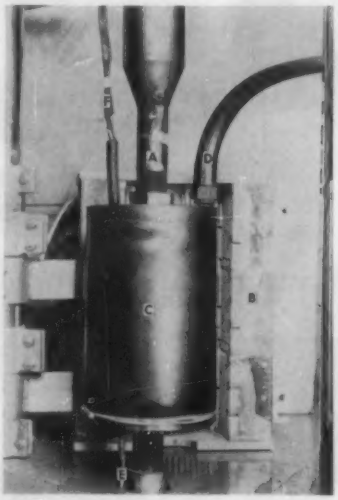


Fig. 5: Fatigue machine with humidity chamber. A—upper loading screw; B—oven swung free of test area; C—rubber sheet surrounding specimen and its clamps; D—air hose supplying 100° F. and 100% relative humidity air; E—air hose for discharge of air and condensate; and F—insulated thermocouple lead wires for temperature

to Dept. 15



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a smooth curve, is shown on Fig. 6, below.

The line representing the static tensile strength is the average of five specimens. The average value of coefficient of variation of all the static tests was 5.3%, and only three tensile values of coefficient of variation were above 10 percent. The individual fatigue test values did not scatter a great deal on either side of the curve that was drawn through them. The scatter was small for all S-N curves except those for heat-resistant phenolic and epoxy resin laminates at 500° F. The amount of scatter at 500° F. probably results from the combined effects of exposure to high temperature and to fatigue loading. The test results are a combination of these, and the time of exposure to high temperature is not proportional to the time (cycles) to failure because of pre-test conditioning and shut-off periods. The smooth curves represent the data well enough to make comparisons with other fatigue data, however.

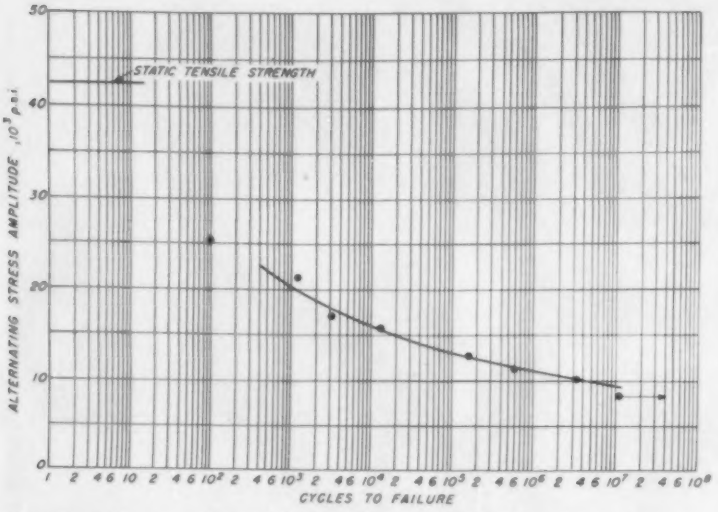


Fig. 6: S-N curve of unnotched specimens of polyester resin reinforced with 181 glass fabric, Volan A finish, and tested at 0° to warp, 100° F. and 100% relative humidity, and 0 mean stress

The fatigue strength values that were observed on the smooth curves at a specific number of cycles have been summarized in Tables IV (below), V (p. 174), and VI (p. 178). The percentage values in the tables are the respective strength values times 100 divided by the static tensile strength of an unnotched specimen of similar material at room temperature. In this manner, the effect of all variables can be related to a common base.

Discussion of results

It has been well established that the continual application of stresses, either alternating, steady,

Table IV: Summary of fatigue strength values of standard laminates at 0 mean stress and loaded at 0° to warp

Glass reinforcement	*Temperature*	*Relative humidity*	*Stress concentration*	*Alternating stress amplitude at* 10^2 *cycles*		10^4 *cycles*		10^5 *cycles*		10^6 *cycles*		10^7 *cycles*	
	°F.	%		10^3 p.s.i.	%*	10^3 p.s.i.	%*	10^3 p.s.i.	%*	10^3 p.s.i.	%*	10^3 p.s.i.	%*
Polyester resin													
181	73	50	Unnotched	32.3	70.2	21.0	45.6	15.6	33.9	12.4	27.0	10.4	22.6
181	100	100	"	20.0	43.5	15.8	34.3	13.0	28.3	11.1	24.1	9.4	20.4
Mat	73	50	"	9.5	68.5	6.7	48.3	5.6	40.3	4.6	33.1	3.5	25.2
Mat	73	50	Notched	8.5	61.2	6.6	47.5	5.4	38.9	4.8	34.6	4.5	32.4
120	73	50	Unnotched	27.6	66.0	21.6	51.6	17.4	41.6	14.0	33.5	11.0	26.3
120	73	50	Notched	24.7	59.1	16.7	40.0	12.0	28.7	9.7	23.2	8.7	20.8
112	73	50	Unnotched	27.2	65.8	19.8	48.0	15.3	37.0	12.4	30.0	10.4	25.2
112	73	50	Notched	23.1	55.9	16.5	40.0	11.8	28.5	9.1	22.0	7.6	18.4
184	73	50	Unnotched	28.1	54.4	20.8	40.3	15.5	30.1	12.5	24.2	10.9	21.1
184	73	50	Notched	28.0	54.2	18.5	35.9	13.5	26.2	10.5	20.3	8.6	16.7
Epoxy resin													
181	73	50	Unnotched	29.3	71.1	26.0	63.1	22.6	54.9	19.4	47.1	16.1	39.1
181	73	50	Notched	26.2	63.6	21.0	51.0	17.8	43.2	15.7	38.1	14.2	34.4
181	100	100	Unnotched	28.7	69.6	23.2	56.3	21.5	52.2	20.0	48.5	16.7	40.5
181	100	100	Notched	25.9	63.0	22.1	53.6	18.5	45.0	14.9	36.2	11.3	27.4

*Stress expressed as percentage of ultimate static tensile strength of unnotched specimens at room temperature.

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Table V: Summary of fatigue strength values of heat-resistant laminates at 0 mean stress

Temperature	Direction of load	Stress concentration	Alternating stress amplitude at 10^3 cycles		10^4 cycles		10^5 cycles		10^6 cycles		10^7 cycles	
°F.	degrees		10^3 p.s.i.	%[a]	10^3 p.s.i.	%[a]	10^3 p.s.i.	%[a]	10^3 p.s.i.	%[a]	10^3 p.s.i.	%[a]
			Polyester resin—181 glass fabric									
73	0	Unnotched	28.4	61.3	22.4	48.7	17.0	37.0	12.9	28.1	10.3	22.4
300	0	"	25.8	56.1	18.5	40.5	13.9	30.2	10.6	23.1	9.0	19.6
500	0	"	13.6	29.6	12.6	27.4	10.4	22.6	7.2	15.7	4.2	9.1
73	0	Notched	24.5	53.2	18.8	40.9	13.7	29.8	10.0	21.8	8.0	17.4
300	0	"	23.6	51.3	17.5	38.1	12.6	27.4	9.1	19.8	7.0	15.2
500	0	"	15.6	33.9	14.3	31.1	12.1	26.3	8.7	18.9	3.8	8.3
73	45	Unnotched	11.5	25.0	7.4	16.1	6.5	14.4	6.5	14.1	6.4	13.9
300	45	"	8.8	19.1	6.1	13.3	4.8	10.4	4.4	9.6	4.4	9.6
500	45	"	6.3	13.7	4.4	9.6	3.2	7.0	2.4	5.2	1.8	3.9
			Epoxy resin—181 glass fabric									
73	0	Unnotched	35.0	81.3	26.3	61.0	19.8	46.0	15.2	35.3	10.9	25.3
73	0	Notched	27.8	64.5	23.4	54.3	19.1	44.2	15.0	34.8	10.7	24.8
300	0	Unnotched	27.0	62.7	21.5	49.9	17.1	39.6	13.9	32.2	11.9	27.6
300	0	Notched	25.0	58.0	19.6	45.5	14.6	33.9	11.0	25.5	9.0	20.9
500	0	Unnotched	13.2	30.6	11.8	27.4	10.4	24.1	9.0	20.9	7.5	17.4
500	0	Notched	15.0	34.8	13.0	30.1	10.8	25.0	8.8	20.4	6.6	15.3
			Phenolic resin—181 glass fabric									
73	0	Unnotched	40.0	89.0	30.6	68.0	21.8	48.5	16.3	36.2	12.5	27.8
73	0	Notched	24.6	54.6	22.6	50.2	18.5	41.1	14.2	31.5	10.0	22.2
300	0	Unnotched	23.8	52.8	21.0	46.6	18.2	40.4	15.4	34.2	12.7	28.2
300	0	Notched	22.7	50.4	19.8	43.9	17.0	37.7	13.5	30.0	8.0	17.7
500	0	Unnotched	19.2	42.6	16.0	35.5	13.5	30.0	10.0	22.2	3.2	7.1
500	0	Notched	20.2	44.7	17.4	38.6	14.0	31.1	9.3	20.6	2.6	5.8
			Silicone resin—181 glass fabric									
73	0	Unnotched	17.2	48.7	14.8	42.0	12.5	35.4	10.2	28.9	7.9	22.4
73	0	Notched	16.1	45.6	13.7	38.8	11.5	32.6	9.2	26.1	6.9	19.6
300	0	Unnotched	9.0	25.6	8.1	23.0	7.6	21.6	7.4	21.0	7.3	20.7
300	0	Notched	9.0	25.6	7.5	21.3	7.0	19.9	6.8	19.3	6.7	19.0
500	0	Unnotched	7.0	19.9	6.6	18.7	6.3	17.9	6.0	17.0	5.6	15.9
500	0	Notched	6.6	18.7	6.3	17.9	6.0	17.0	5.6	15.9	5.3	15.0

[a]Stress expressed as percentage of ultimate static tensile stretch of unnotched specimens at room temperature.

or a combination of both, causes the failure of plastic laminates, even though the stress is less than the short-time static ultimate strength. The fact that notches, water, and temperature affect the strength was also well known, but the magnitude of the effect of combinations of these factors had not been determined. The effects that these variables had on the fatigue strength are explained in the following paragraphs.

Effect of repetition of stress at room temperature: The data obtained at room temperature show a considerable range in fatigue-strength values of unnotched material with different reinforcements and resins. However, Fig. 7, p. 178, shows that the room-temperature laminates made with a polyester resin and different fabric reinforcements have essentially the same fatigue strength from 10^4 cycles to failure, regardless of the fabric type. The mat-reinforced laminate has a fatigue strength considerably below that for the fabric-reinforced laminates. When expressed as a percentage of static tensile strength, the fatigue-strength values of the room-temperature polyester laminates at 10^7 cycles ranged from 20 to 25% and the strength of the epoxy laminate was 40 percent.

The room-temperature data obtained from the heat-resistant laminates and room-temperature laminates show the effect of various resins and a single fabric type on the fatigue strength (Fig. 8, p. 180). There is a wide range of strength values at 10^3 cycles, but the range narrows as the cycles increase. On a percentage basis, the fatigue strength at 10^7 cycles is between 22 and 28% of the static tensile strength for all resins, except the epoxy, which is 40 percent.

Effect of moisture: Normally, the amount of moisture that is



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PITTSBURGH SELECTRON Resins have opened new opportunities for much greater product usefulness with reduced manufacturing costs.

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That's why SELECTRON Resins are today being used in a wide range of products. These can be as different in size, shape and weight as the new "glass" fishing rods so popular among anglers and the modern displays used in Heinz Fast-Food Kitchens. These displays were designed by the Milwaukee Industrial Designers, of Milwaukee, Wisconsin, and molded by G. B. Lewis, of Watertown, Wisconsin.

SELECTRON Resins are of the thermo-setting type. They polymerize to form solids with or without heat and with or without pressure. Parts in which they are used can be molded either by hand lay-up, direct molding, continuous lamination or pre-forming. These resins can also be used without fibers for casting, potting and impregnating.

We'll be glad to have one of our engineers discuss your problems with you without cost or obligation. This may save you time and money.

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Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
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Traffic signs
Fluorescent light fixtures
Television cabinets
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Gas meter housings
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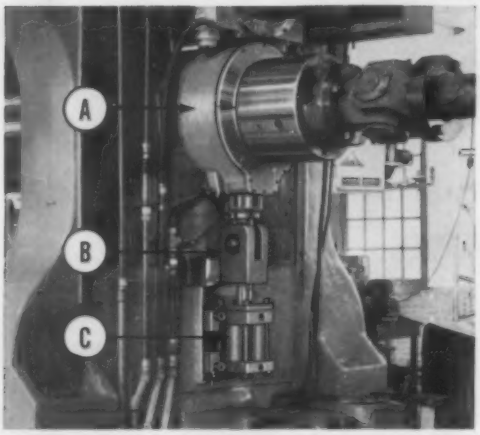
PITTSBURGH PLATE GLASS COMPANY

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ADAMSON UNITED

Performance Report on

SIMPLE ROLL BENDING PRINCIPLE EASILY APPLIED TO NEW OR EXISTING CALENDERS



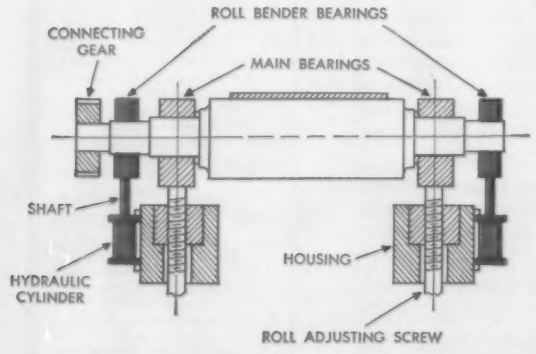
ROLL BENDER installed on bottom roll of inverted-L calender. Consists of (A) auxiliary bearings, (B) clevis and shaft, (C) hydraulic cylinder. Duplicate parts are at other end of roll.

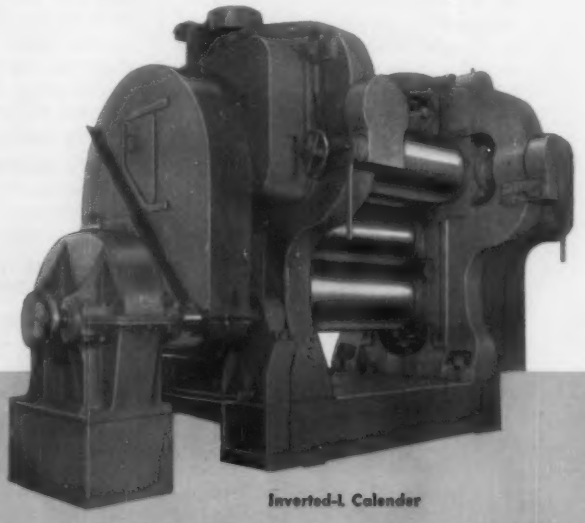
The Adamson ROLL BENDING UNIT provides precision control of calender roll profiles by applying a bending moment to the ends of one or more of the calender rolls. With this patented, hydraulically-controlled unit, roll profile or crown can be increased or decreased as required without interrupting production. It permits fast, accurate correction for changes in roll deflection caused by varying operating conditions.

HOW ROLL BENDING IS APPLIED

The photo and schematic drawing at left show a typical installation of roll bending equipment. A set of auxiliary bearings are mounted at each end of the roll, outboard of the main bearings. These auxiliary bearings are linked by a clevis and shaft to the piston of a hydraulic cylinder. Hydraulic pressure is applied through the cylinder to force the ends of the roll up or down, depending on which way the crown correction is desired.

Adamson can furnish ROLL BENDING on all types of new calenders . . . also available for most types of existing calenders.





Inverted-L Calender

DESIGNERS AND BUILDERS OF BASIC MACHINERY FOR THE RUBBER, PLASTICS AND PLYWOOD INDUSTRIES.

ROLL BENDING

How roll bending increases production . . . lowers costs of rubber and plastics calendering

Little more than three years ago, the Adamson ROLL BENDING UNIT was first made available for general use in the Rubber and Plastics Industry. It has since compiled an outstanding record of successful operation in the production of uniformly accurate sheet and film of a wide range of thicknesses.

- One plastics processor reports that with the addition of roll bending equipment, he is able to produce excellent flat sheet in gauges ranging from 2 to 14 mils — without the use of roll crossing. This calender was previously limited in gauge ranging from 2 to 5 mils.
- . . . Another customer estimates that roll bending will effect savings of up to 2c per yard in his production of about one million yards per month — a possible yearly saving of $240,000.

Our engineers will be glad to give you complete information on roll bending and explain how its advantages could benefit your particular operation. Call us in for discussion today. No obligation, of course.

6 important facts about ROLL BENDING

1 **Extremely accurate crown compensation**—permits precise control of profile, improves quality of product, reduces waste and scrap loss.

2 **Increases calender versatility**—wider range of stocks can be run on a single calender.

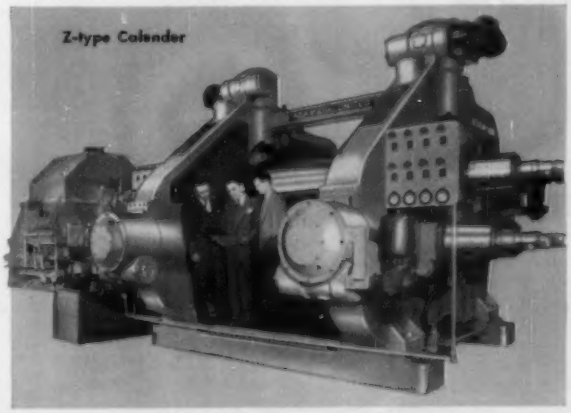
3 **Low initial cost**—most economical method of precision crown control. Unlike roll crossing, roll bending does not require separate pinion stand drive.

4 **Low installation cost**—Requires little downtime. Can be added to most existing rubber or plastics calenders, usually requiring but slight alteration to the machine.

5 **Compensates for roll wear**—reduces downtime needed for grinding or changing rolls.

6 **Compact, adaptable**—requires little space, can be installed on one or more rolls. Can be used with either crowned or straight rolls.

Adamson has exclusive sales and manufacturing rights, under patents held by The Goodyear Tire and Rubber Co.


Z-type Calender

Roll bending reduces maximum working stresses on rolls — does not shorten journal bearing life.

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absorbed by glass-reinforced plastic laminates is on the order of ½ to 2 percent. However, these small amounts of moisture cause reductions in static short-time strength and in fatigue strength. For example, the short-time tensile strength of the standard polyester resin laminate was reduced from 46,000 to 42,330 p.s.i. due to the absorption of moisture, and the fatigue strength (Fig. 9, p. 180) was reduced from 32,300 to 20,000 p.s.i. at 10^8 cycles and from 10,400 to 9400 p.s.i. at 10^7 cycles. This phenomenon of smaller reductions in fatigue strength as the number of cycles increases was observed in the previous study at 73° F. and 100% relative humidity (2). It was believed at that time that some drying was taking place. However, in this experiment at 100° F. and 100% relative humidity, the specimens were thoroughly wet at all times. Current data, therefore, show that moisture affects the fatigue strength of standard polyester resin laminates only slightly. At 10^7 cycles, the drop in fatigue strength was only 2% of the static tensile strength.

Fatigue data obtained on epoxy resin laminates show the effect of moisture absorption to be insignificant.

Effect of stress concentration (notch of 1/16-in. radius): Almost every S-N curve that was experimentally obtained for unnotched specimens has a companion curve for notched specimens. Data for notched and unnotched specimens of standard polyester resin reinforced with 181 glass fabric have been reported (2). The S-N curves for notched specimens are in almost every instance lower than those for unnotched specimens. Exceptions exist at elevated temperatures, either because the degree of scatter of data is greater than the effect of the notch or because the low compressive strength acts to disrupt the usual trend.

A typical example of the S-N curves that compare strength values of notched and unnotched specimens is shown in Fig. 10, p. 185. It should be noted that the S-N curves for notched specimens of the standard polyester laminate reinforced with various fabrics are approximately parallel to each other. Parallelism of the S-N curves of notched and unnotched material is illustrated for the laminate with 184 fabric. This parallelism between companion curves of notched and unnotched material exists in general throughout the entire study. The degree of difference between the two curves varies for each material.

The average fatigue strength for notched material at room temperature after 10^7 cycles at 0 mean stress is about 23% of the

Table VI: Effect of 3 mean stress levels on fatigue strength of heat-resistant polyester resin reinforced with 181 glass fabric, Volan A finish

Stress concentration	*Temperature*	*Mean tensile stress level*	*Static tensile strength*	*Alternating stress amplitude at 10^5 cycles*	*10^6 cycles*	*10^7 cycles*	*10^8 cycles*	*10^9 cycles*
	°F.	10^3 p.s.i.	10^3 p.s.i.	10^3 p.s.i.	10^3 p.s.i.	10^3 p.s.i.	10^3 p.s.i.	10^3 p.s.i.
Unnotched	73	0	45.98	28.4	22.4	17.0	12.9	10.3
		9.19	45.98	22.6	15.7	10.2	6.5	5.0
		22.99	45.98	11.4	6.2	4.0	2.7	2.4
Notched	73	0	35.20	24.5	18.8	13.7	10.0	8.0
		7.04	35.20	18.1	13.0	8.4	5.3	3.5
		17.60	35.20	9.4	5.7	3.4	2.1	1.5
Unnotched	300	0	40.65	25.8	18.6	13.9	10.6	9.0
		7.28	40.65	19.8	13.4	9.0	6.0	4.5
		18.20	40.65	11.7	6.6	4.0	2.8	2.5
Notched	300	0	32.38	23.6	17.5	12.6	9.1	7.0
		5.80	32.38	17.2	12.2	7.8	4.7	3.3
		14.54	32.38	9.4	6.3	3.7	2.2	1.7
Unnotched	500	0	38.11	13.6	12.6	10.4	7.2	4.2
		7.62	38.11	18.0	12.7	6.6	4.0	3.1
		19.05	38.11	7.7	4.2	2.4	1.6	1.4
Notched	500	0	31.03	15.6	14.3	12.1	8.7	3.8
		6.21	31.03	17.3	12.5	6.9	3.3	1.9
		15.52	31.03	8.3	4.2	2.1	1.3	1.1

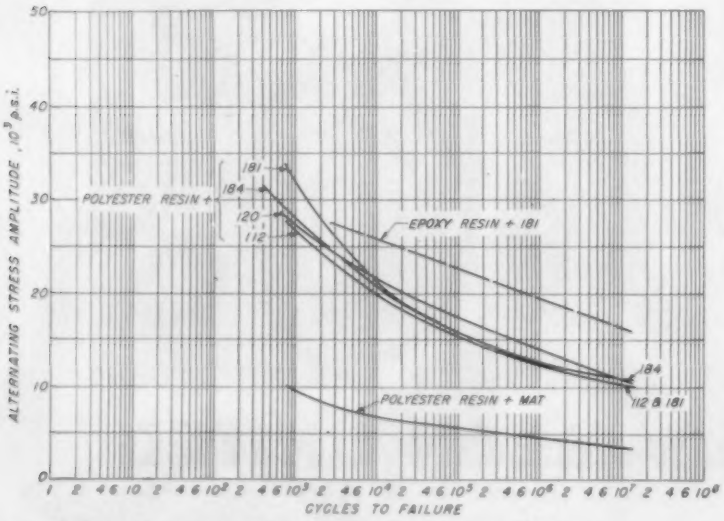


Fig. 7: S-N curves of unnotched specimens of polyester resin reinforced with various glass fabrics and a glass mat and tested at 0° to warp, 73° F. and 50% relative humidity, and 0 mean stress

CYANAMID

PLASTICS NEWSFRONT



EYE-LURING COLOR CAPS BEST-SELLING PACKAGES

To compete for attention on crowded toiletry counters and shelves today, many best-selling products add a cap of colorful BEETLE® Urea Molding Compound. The beauty of color—any color—is permanently molded in. Closures of BEETLE Plastic are practical, too: they resist alcohol, acetone and other solvents, resist staining, and don't have an electrostatic affinity for dust, so stay clean longer on shelves.



NEW PIPE JACKET STOPS UNDERGROUND CORROSION

Strong jackets of spirally wrapped glass cloth and LAMINAC® Polyester Resin combat corrosion in new prefabricated insulated pipe conduit for underground steam and hot-water systems. Developed by Temploc, Inc., Baldwin Park, Calif., the protective two-ply shell is much lighter, less costly and more corrosion resistant than conventional steel or tar-protected conduit. Insulation is sealed and vapor-proofed at the ends by bonding the cloth-resin shell directly to the bare pipe. Field joints of insulation, cloth and resin are easily applied at the site.



IMPROVED HOUSING FOR NEW pH METERS

To make the housings for Pocket model and ZER O MATIC* bench model pH meters (shown) unusually strong, impervious to chemicals and resistant to scratching and chipping, Beckman Instruments, Inc., molds them of CYMEL® 1077 Melamine Molding Compound. This tough, break-resistant plastic protects the delicate mechanism and also provides the attraction of color without the added production steps required in finishing metal. Color is part of the housing itself; there is no coating to wear or chip off . . . no metal to corrode. *Trademark Beckman Instruments, Inc.

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CYANAMID Plastics and Resins Division
MATERIALS FOR TOMORROW

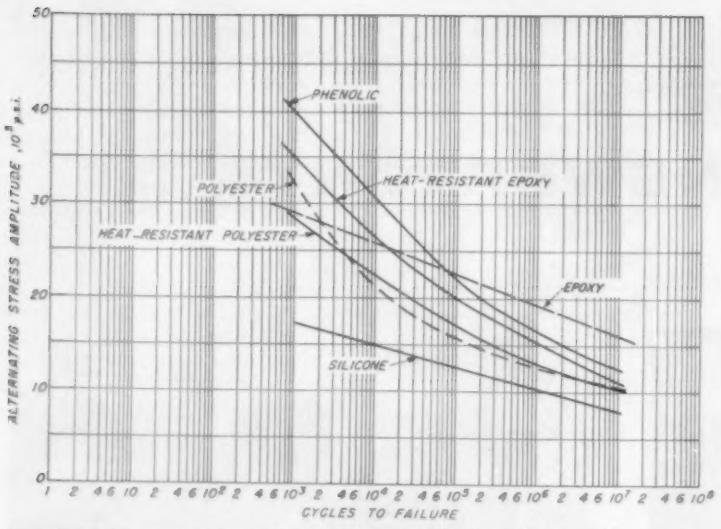


Fig. 8: S-N curve of unnotched specimens of heat-resistant resins reinforced with 181 glass fabric, tested at 0° to warp, 73° F. and 50% relative humidity, and 0 mean stress

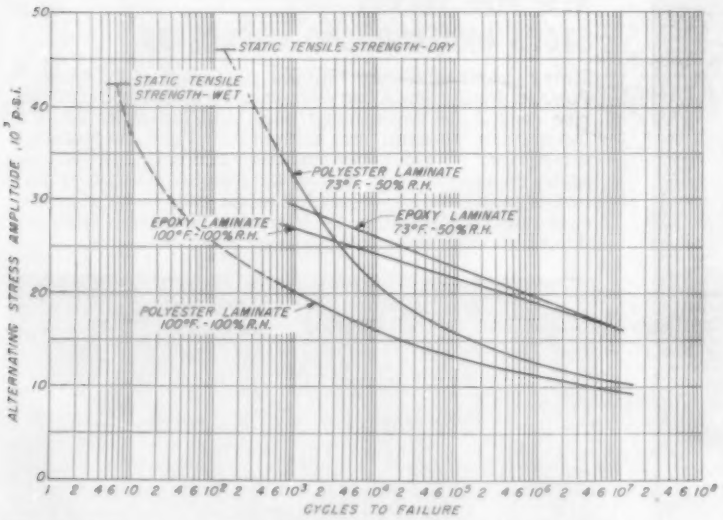


Fig. 9: S-N curves of unnotched specimens of polyester and epoxy resins reinforced with 181 glass fabric, Volan A finish, showing effect of moisture. Test conditions: 0° to warp, 0 mean stress

room-temperature ultimate tensile strength (Tables IV and V). However, the average difference in fatigue strength between notched and unnotched material at room temperature after 10^7 cycles at 0 mean stress is only about 4.5% of the room-temperature ultimate tensile strength. Those materials with the highest percentage of reduction would be considered the most sensitive to stress concentration. In this respect, the standard polyester laminate reinforced with 112 fabric shows the greatest sensitivity.

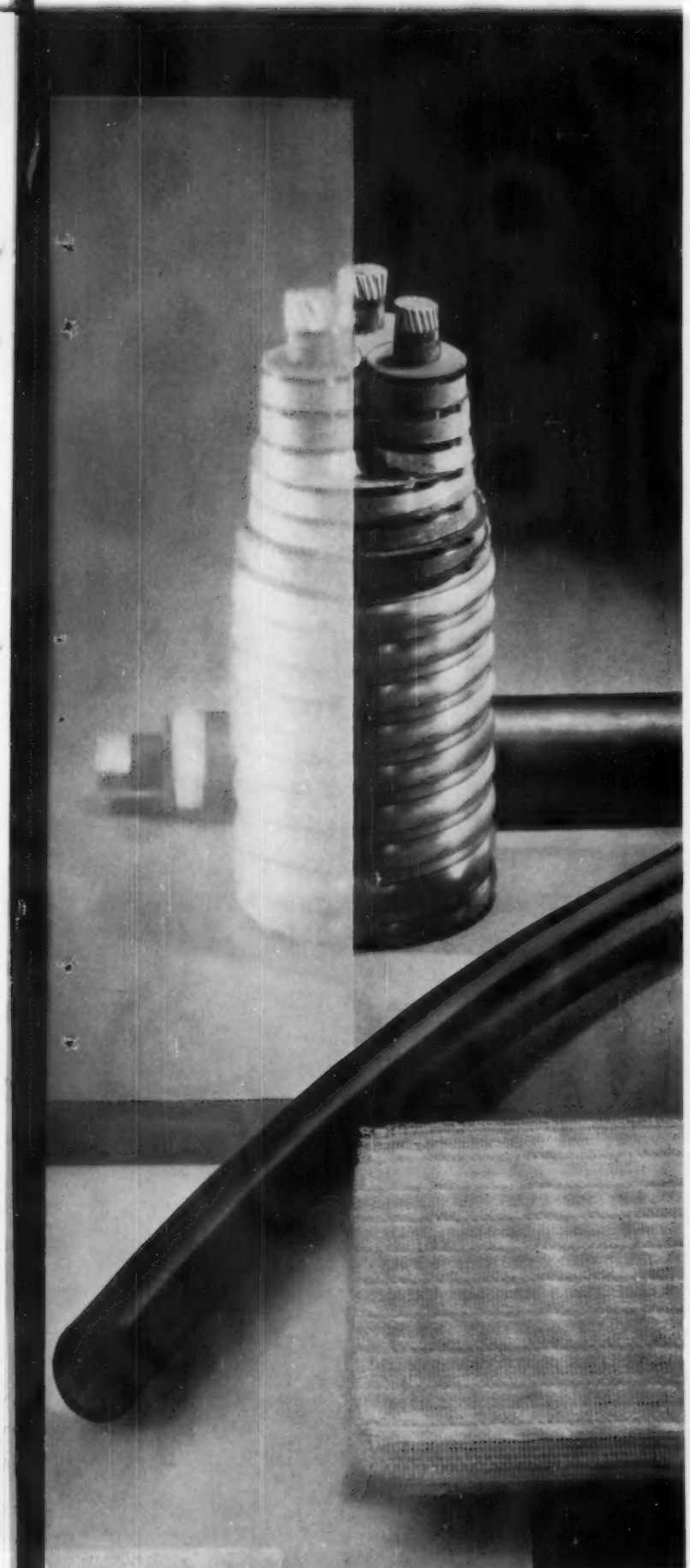
At high temperature, particularly at 500° F., the difference between the strength values of notched and unnotched specimens at 10^7 cycles is generally smaller than at room temperature (Table V). Two of the materials show progressively decreasing differences with increasing temperature. At high temperature, the failure was commonly in compression and showed as a shear failure at an angle to the plane of the specimen. In a compression failure, the notch would be expected to have less effect than in the case of a tensile failure through the notch. Therefore, fatigue data at elevated temperatures probably should not be used as an indication of the sensitivity of the material to a notch.

Another effect of notching, which was not so readily noticeable, was the apparent reduction of the degree of scatter. It was noted in the individual figures that the data points of unnotched material had more scatter than data from the notched material.

Effect of direction of loading: The laminates used in this fatigue study were ¼-in.-thick, flat plates made of parallel laminations of individual layers of glass fabric. The majority of the specimens were cut from the laminates so that their lengthwise (axial) direction was parallel to the warp direction of the fabric. A few specimens of heat-resistant polyester resin laminate, however, were cut from the flat plates with their lengthwise direction at 45° to the warp direction. These specimens were unnotched and were tested at room temperature, 300 and 500° F. The results of these tests are shown in Table V and in Fig. 11, p. 185. In Fig. 11, these results are compared with fatigue strengths at 0° to warp. Since the static tensile strength at 45° to warp is usually lower than that at 0° to warp, the fatigue strength would be lower also. The data show that at room temperature an endurance limit is reached at about 40,000 cycles and a stress level of 6500 p.s.i. Fatigue data on specimens tested at room temperature and 0° to warp do not show an endurance limit at 10^7 cycles. Time and high temperature cause S-N curves to continue their decline, so that it is not certain whether an endurance limit was reached at 10^7 cycles at elevated temperatures.

Effect of elevated temperature: As is true for other properties, exposure to elevated temperature results in a reduction of fatigue strength. The fatigue data for four heat-resistant laminates (Table V) show this effect at 300 and 500° F. While each of the lami-

(*To page* 185)



Polyethylenes

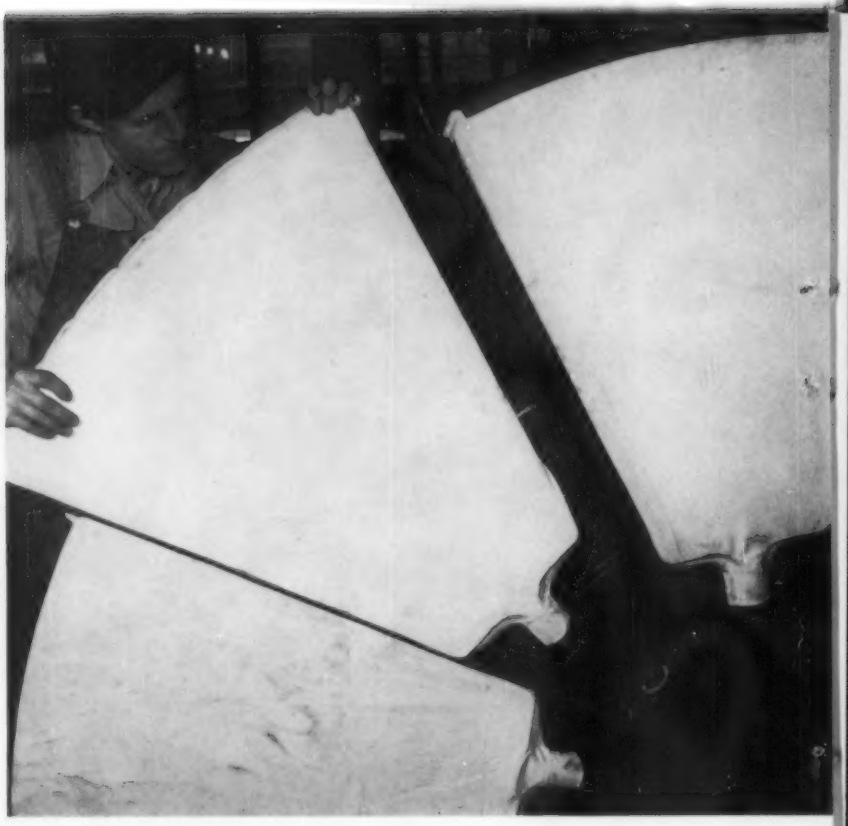
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see the next page

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Extruded monofilaments of BAKELITE Brand Polyethylene have been woven into cloth. It is remarkably strong, durable, and chemical-resistant. For example, these filter bags have lasted 1000 hours compared to 80 for the previous material. They have been filtering molybdenum particles from slurry for six months and still show no signs of wearing out. They have stood up under the weight of the caked molybdenum, continual wetting and drying, and the alternate pull by vacuum and push by compressed air to loosen the cake. The polyethylene cloth is non-blinding (pores won't clog) and has cut replacement down-time considerably.



Polyethylene Sheets for vacuum forming

Extruders get a bigger bite of the boom in vacuum-forming with this Bakelite development. DFD-4030 is the first polyethylene specifically compounded for sheet extrusion and vacuum- or thermo-forming. It can be fabricated by modifying equipment now used for continuous in-line extrusion and vacuum-forming of impact styrene. Housewares offer a great potential field. BAKELITE Brand Polyethylene DFD-4030 provides high molecular weight, superior gloss, unlimited colorability, and quick, trouble-free processing.

Notice the high gloss of the polyethylene sheet being placed in the clamping frame of the vacuum-forming machine.



After heating, the sheet in its clamping frame drapes over bowl mold before vacuum is applied.





Polyethylene wire and cable covering

These snow-covered telephone lines in the mountains of Washington were installed in 1950. Their extruded polyethylene insulation shows no deterioration, despite temperatures from 40 degrees below zero to 115 above. The light weight of polyethylene is an aid to installation, especially in terrain like this. The electrical insulating values are so good that lines can be close together without danger of interference. This saves adding crossarms when new lines are installed. Extruded BAKELITE Brand Polyethylene has been used for wire and cable applications ranging from the newest Atlantic cable to television lead-in, and meets the standards of all leading associations.



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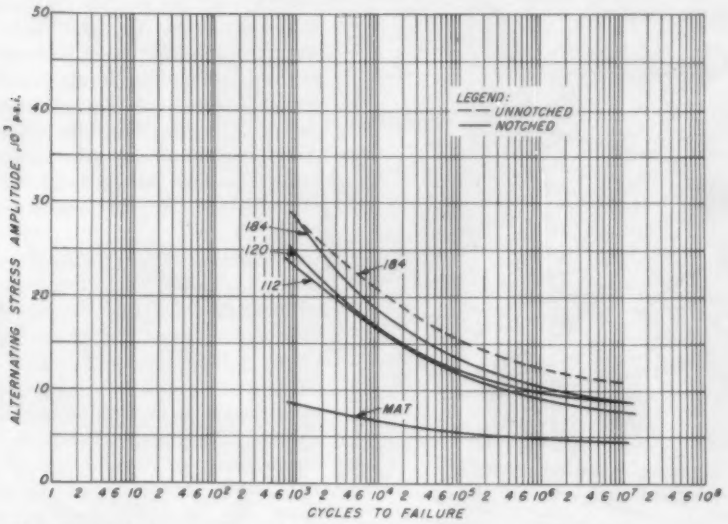


Fig. 10: S-N curves of notched specimens of polyester reinforced with various glass fabrics and mat, showing effect of notch. Test conditions: 0° to warp, 73° F. and 50% R.H., and 0 mean stress

nates showed the characteristic decrease in fatigue strength with increased number of cycles, they also showed a decrease in fatigue strength with increase in temperature. Of course, the magnitude of the respective decreases varied with the type of laminating resin.

Typical S-N curves of the heat-resistant polyester laminate obtained at three temperatures are shown in Fig. 11. Similar curves were obtained at 0° to warp for the other three heat-resistant laminates. The effect of temperature and cycles on the fatigue strength of these other laminates is shown in Fig. 12. This graph shows again that the fatigue strength drops considerably from 10^3 to 10^7 cycles at constant room temperature for each laminate. It also shows that the fatigue strengths of the four laminates are more nearly equal in value at 10^7 cycles than at 10^3 cycles. The effect of increasing temperature at 10^7 cycles causes an additional reduction in strength, which is not as great as the effect of fatigue. The effect of the combination of fatigue and temperature is that they lower the fatigue strength to between 3200 and 7500 p.s.i. at 10^7 cycles and 500° F. or to between 7.1 and 17.4% of their static tensile strength value at room temperature.

The effect of temperature on fatigue strength appears to be related to the strength retention of the laminate with increasing periods of high-temperature exposure. For example, although the epoxy and silicone laminates had the lowest static properties at 500° F., their fatigue strength at 10^7 cycles was somewhat higher than that of the polyester and phenolic laminates. Stress-rupture data do not indicate a serious effect when the polyester laminate is exposed to elevated temperatures for extended periods. It appears, therefore, that this laminate is more sensitive to the length of exposure at elevated temperature when subjected to fatigue loading.

The effect of temperature on the endurance limit of laminates loaded at 45° to warp is pointed out above. The weakening effect of temperature was not confined to 0° and 45° to the warp, however. It also affected the strength perpendicular to the laminations. The clamps that held the fatigue specimen in the machine had to be

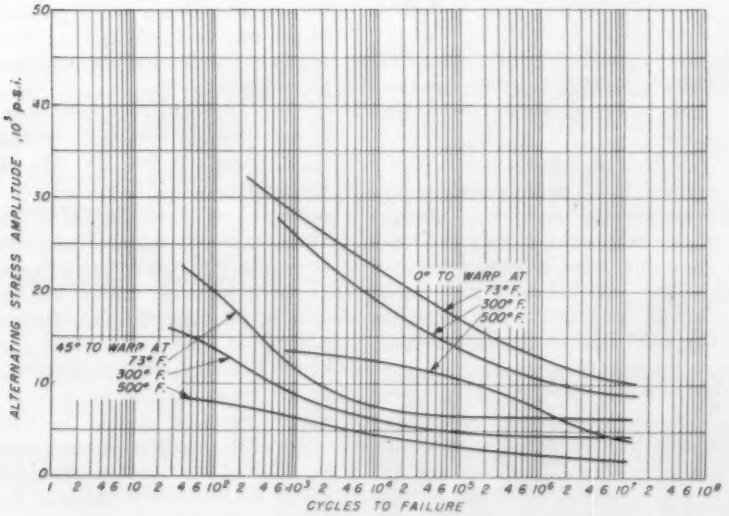


Fig. 11: S-N curves of unnotched specimens of heat-resistant polyester reinforced with 181 glass fabric, Volan A finish, showing effect of temperature and direction of loading. (0 mean stress)

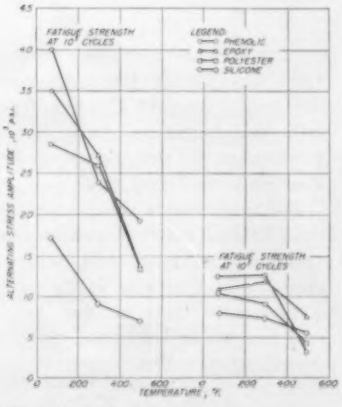


Fig. 12: Effect of temperature on fatigue strength of four heat-resistant fibrous glass-reinforced plastics laminates at 0 mean stress

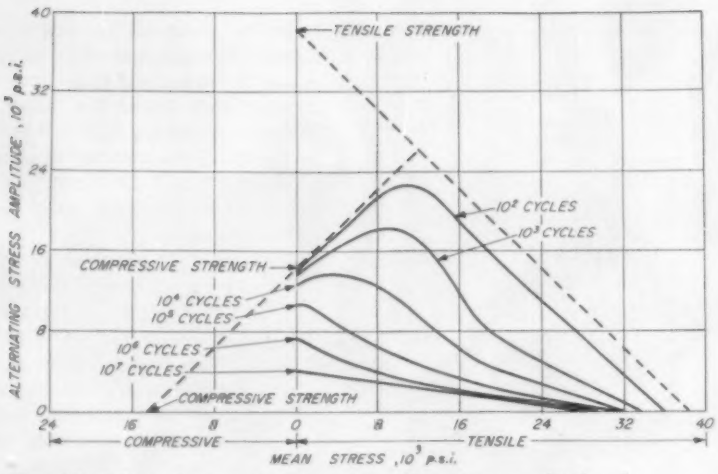


Fig. 13: Effect of mean stress on alternating stress amplitude of unnotched heat-resistant polyester resin reinforced with 181 glass fabric, Volan A finish, tested at 500° F.

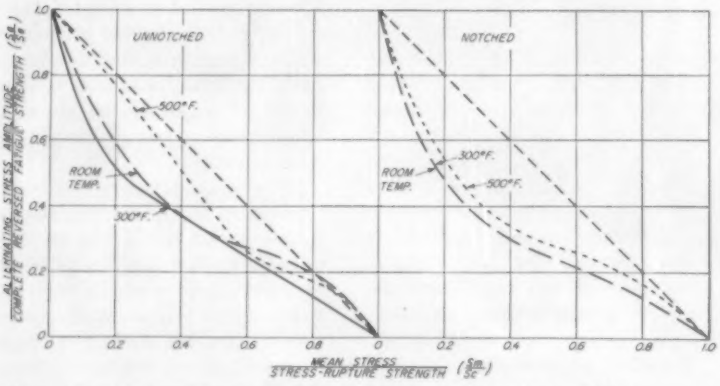


Fig. 14: Non-directional modified Goodman diagrams for notched and unnotched, heat-resistant polyester resin reinforced with 181 glass fabric, Volan A finish, for room and elevated temperature at 10 million cycles

tightened during the course of the test to prevent slippage. This indicated that some crushing perpendicular to the plane of the specimen was occurring.

The weakness in compression in the plane of the specimen at elevated temperatures was demonstrated quantitatively by the static compression tests on the heat-resistant resin laminates. It was found that the compressive strength varied between 20 and 95% of the tensile strength, depending on the material and temperature.

The scatter of the fatigue data at 500° F. for the heat-resistant epoxy laminate was partially due to erratic failures. The majority of the failures were in compression, although some were in tension.

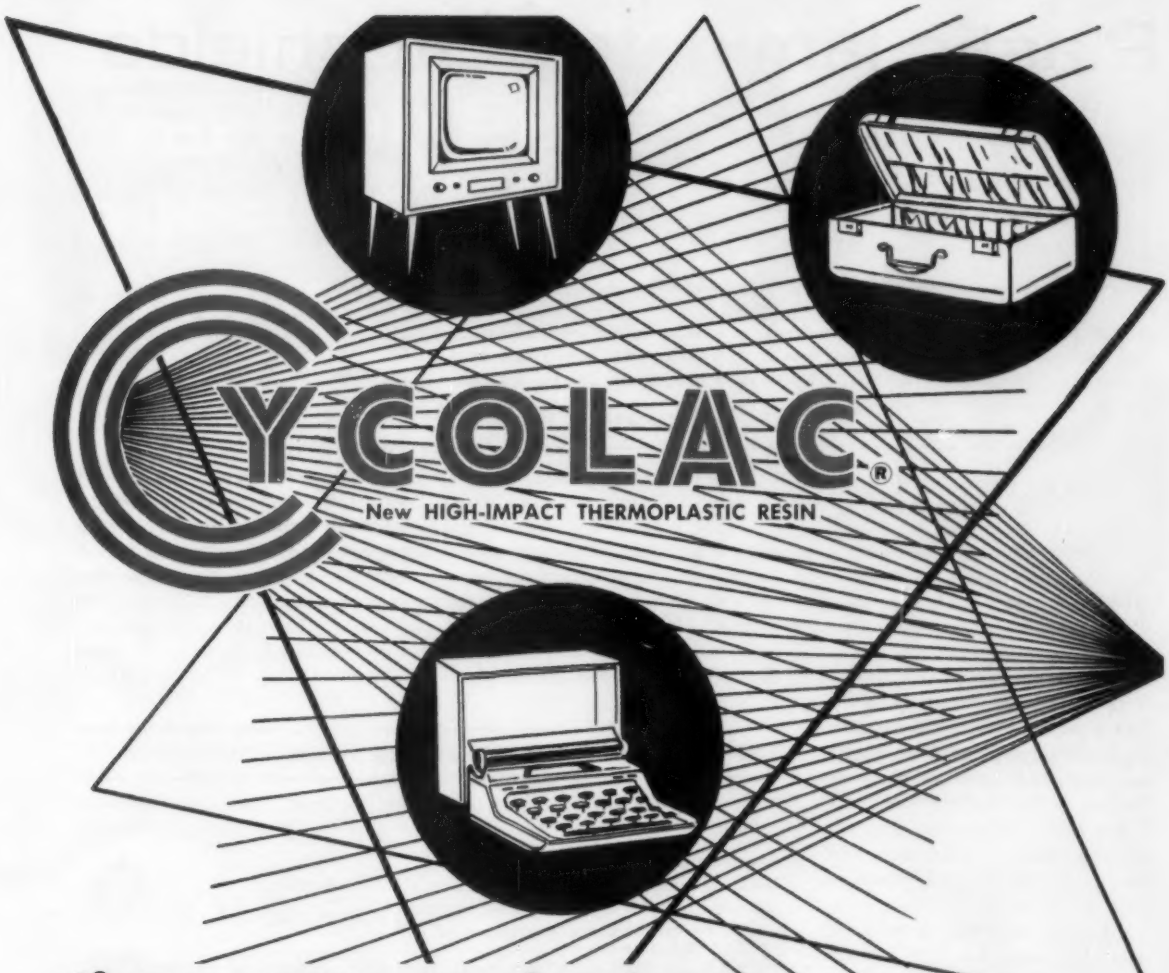
Effect of various mean stress levels: In all of the previous discussion, the alternating stresses have been equal tensile and compressive stresses that fluctuated above and below a zero mean stress. In practice, this condition is only one of the many mean stress conditions that may be encountered. The alternating stress amplitude at 0 mean stress may vary from 0 to the ultimate tensile or compressive strength of the material. The mean stress level may vary from zero to the ultimate strength of the material when time, temperature, and other factors are considered. Data were obtained on the heat-resistant polyester resin laminate at three mean stress levels, which were fractions of the ultimate tensile strength. The data which were obtained on notched and unnotched material at three different temperatures are presented in Table VI.

A typical graphical presentation is shown in Fig. 13, left, for unnotched material tested at 500° F. This figure shows the alternating stress (compressive or tensile) amplitude as ordinates, and the mean stress levels are shown as abscissas. They may also be either compressive or tensile stresses. The data plotted on these coordinates are the alternating stress amplitudes at various numbers of cycles, which were picked from the S-N curves of the respective mean stress conditions. When the alternating stress amplitude is zero, the abscissa intercepts are equal to the steady stress (from stress-rupture data) that can be supported for a period that is equivalent to the number of cycles shown.

Laminated plastics at elevated temperatures do not always have equal tensile and compressive strength values. If they are not equal, the alternating stress amplitude that can be sustained for a given number of cycles depends partly on the compressive strength. Thus, when tensile mean stresses are applied, somewhat higher alternating stress amplitudes can be sustained at low levels of mean stress than at zero mean stress.

The alternating stress-mean stress diagram changes to the form shown in Fig. 14, left, if modified to non-dimensional coordinates to show the effect of temperature at a specified time period. In that figure, the ordinate is the alternating stress amplitude S_a for a specified lifetime or number of cycles divided by the static stress-rupture strength S_c at the same lifetime for a completely reversed stress. The abscissa is the specified mean stress S_m divided by the experimental static stress-rupture strength S_c for a specified lifetime, converted to the same period as fatigue life.

(*To page* 293)



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Plastic laminate heat shields

*J. G. Stansbury**

Highly efficient heat barriers are produced by coating fibrous glass laminates with thin reflective coatings. These new heat barriers offer advantages over conventional insulating materials and provide a unique method for the protection of heat-sensitive components.

The problem of heat dissipation in aircraft has become increasingly acute. The protection of vital heat-sensitive components from excessive temperatures is equally critical. As a contribution to the solution of this latter problem a series of heat shields have been developed based on plastic laminates that have a highly reflective surface on the "hot" side. These shields offer a combination of high thermal efficiency with minimum weight and minimum bulk.

Silicone laminates provide an excellent base for heat shields that must withstand long-time, high-temperature exposure. These laminates have sufficient strength at high temperature to merit their consideration for at least semi-structural applications.

Silicone laminates with 181 Fiberglas cloth as a filler (SPC X5G-138) provide maximum strength per unit of thickness and weight. However, 181 cloth impregnated with silicone resin is extremely difficult to use for molding into parts that have a substantial amount of draw. To improve moldability of such parts a silicone-impregnated square-weave cloth can be used, which provides maximum draw without damage to the fabric. The laminate made with the square-weave cloth (SPC X5G-176) has slightly lower physical properties but the yield of satisfactory deep-drawn parts is substantially improved by its use. Silicone-bonded asbestos laminates have excellent flexural strengths but are somewhat lower in tensile and impact strength than silicone-bonded fibrous glass laminates. The asbestos laminates are reported to have better strength retention on long-time exposure to temperatures above 650° F. Comparative physical properties of X5G-138 and X5G-176 are given in Table I, below.

Glass cloth laminates bonded with high-temperature-resistant phenolic resins have likewise proved to be satisfactory bases for reflective coatings. The properties of such a laminate (X4G-116) are given in Table II, p. 192. Reflective coatings have been success-

(*To page* 192)

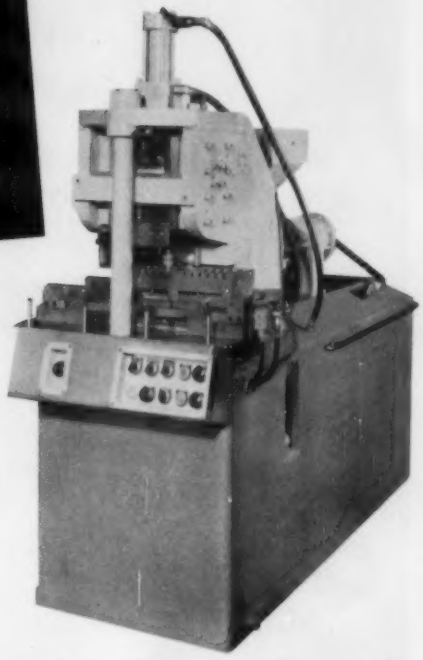
Table I: Physical properties of silicone-glass cloth laminates

Property	*Laminate X5G-138*	*Laminate X5G-176*
Specific gravity	1.8	1.8
Ultimate tensile strength, p.s.i.	38,000	30,500
Ultimate flexural strength (tested at temp. after 2-hr. conditioning at temp.), p.s.i.		
77° F.	40,000	28,800
100°	37,000	26,000
200°	26,000	22,000
300°	20,000	17,500
400°	17,000	14,000
500°	16,000	11,000
600°	12,000	10,000
Modulus in flexure (tested at temp. after 2-hr. conditioning at temp.), 10^6 p.s.i.		
77° F.	2.6	2.3
100°	2.5	2.2
200°	2.4	2.1
300°	2.1	1.9
400°	2.0	1.5
500°	2.0	1.4
600°	2.0	1.4
Water absorption (ASTM D 570), %	0.08	0.08
Thermal conductivity (Dow Corning method), B.t.u./hr./sq.ft./in./°F.		
100° F.	0.6	0.6
200°	0.65	0.65
300°	0.8	0.8
400°	0.95	0.95
500°	1.05	1.05
600°	1.2	1.2
Thermal conductivity (K by Gier-Dunkel method), B.t.u./hr./sq.ft./in./°F.		
80° F.	2.52	2.52
Specific heat, cal./°C./gram	0.25	0.25

Presented at the 12th Annual Technical and Management Conference, Society of The Plastics Industry, Inc., Reinforced Plastics Division, Chicago, Ill.

*Technical manager, Swedlow Plastics Co., Los Angeles, Calif.

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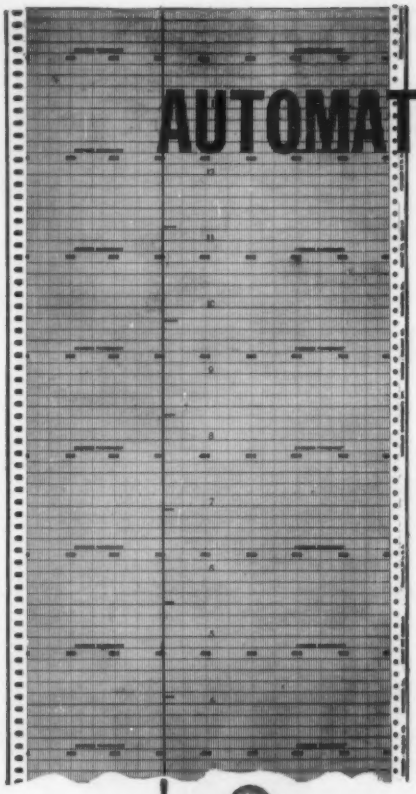
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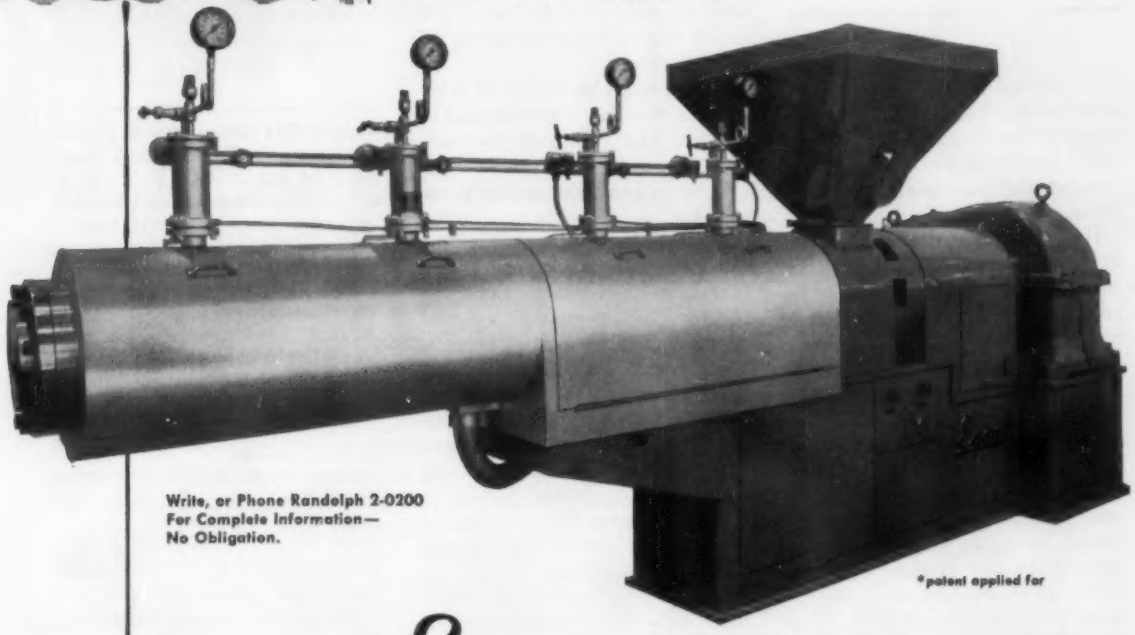
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Table II: Physical properties of phenolic-glass cloth laminate

	X4G-116
Specific gravity	1.9
Ultimate tensile strength, p.s.i.	30,000
Ultimate flexural strength (tested at temp. after 2-hr. conditioning at temp.), p.s.i.	
77° F.	71,000
100°	68,000
200°	65,000
300°	59,000
400°	54,000
500°	48,000
600°	42,000
Modulus in flexure (tested at temp. after 2-hr. conditioning at temp.), 10^6 p.s.i.	
77° F.	4.8
100°	4.2
200°	3.9
300°	3.4
400°	3.1
500°	2.9
600°	2.7
Water absorption, %	0.08
Thermal conductivity (K by Gier-Dunkel method), B.t.u./hr./ft.²/in.°/F.	3.96
Specific heat, cal./°C./gram	0.26

Table III: Temperature reduction through 1/16-in. silicone laminate with 101 coating.

Muffle furnace temp.	*Temperature of cold face of laminate*	*Air temperature 3/8 in. from door*
° F.	° F.	° F.
250	126	—
500	190	100
750	274	150
1000	363	180
1250	450	210
1500	561	260

fully applied to a TAC polyester-glass cloth laminates. Conventional polyester- and epoxy-glass cloth laminates are suitable for heat shields at lower temperatures.

It is recognized that for certain applications the data supplied do not go to a sufficiently high temperature. We have no equipment available for carrying out physical tests above 600° F. Further, the techniques we have seen thus far for tests at temperatures much in excess of 600° F., while possibly applicable to metals which have good thermal conductivity, are poorly adapted to testing plastic laminates which have considerably lower thermal conductivity. If plastic laminates are to have wide acceptance for use at temperatures above 600° F., it is essential that reliable data be developed on the properties of laminates at these temperatures. Also unavailable to the designer are data on the properties of plastic laminates with a temperature differential through the laminate.

The method of measuring the effectiveness of a heat barrier should be based on tests somewhat comparable to the conditions in which the material will be used in service. In our "standard" test we determine the "cold" face temperature of a heat shield which is used, with the reflective surface inward, as the door of an electric furnace. The temperatures given in Table III, above, are equilibrium temperatures reached approximately ½ hr. after the beginning of the test. The air temperature 3/8 in. away from the door was taken in relatively stagnant air since the cold face of the shield was adequately protected from drafts.

In this test a 1/32-in. shield is almost as effective a heat barrier as a shield based on a 1/16-in. laminate. A 1/16-in. shield is fully as effective a heat barrier as a 1/8-in. shield.

This test, while duplicating some potential service conditions, is subject to criticism since the recorded temperature of the cold face is somewhat dependent upon the method of holding the thermocouple in contact with the cold face. The air temperature 3/8 in. away from the cold surface can vary so greatly with convection due to room conditions that we no longer determine this temperature in our evaluation of the effectiveness of new coatings.

In our efforts to develop a more scientific test for the efficiency of our reflective coatings we considered determining the *K* factor of a coated laminate and spectral reflectivity. The *K* factor of a coated laminate is of no significance in determining the reflectivity of the coating since the thermal conductivity value as determined by either the guarded hot plate or the Gier-Dunkel method is the same for coated as well as uncoated laminates.

The measurement of spectral reflectivity in the infra-red range (wavelengths above 500 Å) represented by temperatures of 200 to 1500° F., hardly qualifies as a suitable test for evaluating a large number of samples.

The most easily performed test to evaluate the efficiency of coatings which would have any general acceptance is total emissivity. We have had total emissivity at 200 to 800° F., determined by a university laboratory on both our coatings and on the basic laminates. Since for all practical purposes reflection is one minus emissivity, the emissivity is a true measure of coating efficiency. Table IV, above, gives values for the emissivity of several of the coatings we have developed compared with the emissivity of the base laminates. It would have been desirable to have emissivity run at a higher temperature, but the equipment available for this purpose would not go above 800°

(*To page* 294)

Table IV: Emissivity of plastic laminates and reflective coatings[a] at 200 to 800° F.

Material	*Total emissivity*
Silicone laminate	0.99 to 0.91
Phenolic laminate	0.99 to 0.91
101 coating on laminate	0.09 to 0.06
102 coating on laminate	0.36 to 0.30
602 coating on laminate	0.10 to 0.05

[a]The thickness of a single aluminum coating is about 800 Å. Several coats can be applied; however, upon doing so, heat reflection decreases.

4th British Plastics Exhibition and International Convention

Occupying more than double its previous amount of floor space, the 1957 British Plastics Exhibition will draw attendance from all over the world

A special but generally recognized function of the British plastics industry is its role as a "bridge" in technology, engineering, and marketing between Europe and the Americas. This is aside from its function as an industry in the British Commonwealth of Nations.

It is no surprise, therefore, that the 4th British Plastics Exhibition and Convention has turned out to be a truly international event. Established to show the materials, facilities, processes, and products in plastics produced by the United Kingdom and the British Commonwealth, the Exhibition will include representation from the United States, Switzerland, W. Germany, Italy, Sweden, Belgium, France, Holland, and even Czechoslovakia.

On the Conference schedule of 17 presentations, speakers from the United States will be responsible for four events.

As compared with the vast and concentrated events of a similar nature in the United States, the Exhibition, extending over a period of eleven days, including a weekend, and the Convention extending from Thursday, July 11th, through Wednesday, July 17th, should provide visitors foreign to Britain with ample time for contacts, study, and enjoyment. At no time in the history of the plastics industries around the world have direct personal contacts been so important.

Among the features of interest to non-Britons will be a special display of the best designs in plastics household products from each of the major countries in Europe.

The Show will be open to the public at an admission fee of two shillings and sixpence. Organizer is J. L. Wood; Convention Manager, Phillip Morgan, Editor, *British Plastics;* Press Officer, M. J. Seymour.

The event, held every second year, is the result of cooperation between the British Plastics Federation and *British Plastics* magazine. Correspondence should be addressed to the above officers at Dorset House, Stamford Street, London S.E.1, England.

The program of papers to be presented at the Conference sessions and a list of exhibitors at the Show will be found on the following pages.

Program of sessions at the

British Plastics International Convention 1957

National Hall, Olympia, London, England

Thursday, July 11th

Polyolefins

"Synthesis and properties of linear polyolefins," by H. F. Mark, *Polymer Research Institute, Brooklyn, N.Y., U.S.A.*

"Some aspects of low pressure polythenes," by Erhard Grams, *Farbwerke Hoechst AG., Frankfurt, Germany.*

Polyethylene

"Light scattering of polythene in solution," by P. B. McFarlane, F. Yearsley, and S. W. Hawkins, *Imperial Chemical Industries Ltd., Alkali Div., Winnington, England.*

"Permeability of high density polythene films," by V. T. Stannett, *State University of New York, Syracuse, N.Y., U.S.A.*

"Stress cracking in polythenes," by James A. Reid, *Phillips Petroleum Co., Bartlesville, Okla., U.S.A.*

Friday, July 12th

Polyvinyl chloride I

"The physical properties of lightly plasticised p.v.c. compounds," by R. A. Horsley, *BX Plastics Ltd., Manningtree, England.*

"Foamed polyvinyl chloride," by D. A. Lever and G. Burke, *British Geon Ltd., London, England.*

Polyvinyl chloride II

"High impact vinyl materials," by Clarence E. Parks, *B. F. Goodrich Chemical Co., Cleveland, Ohio, U.S.A.*

Monday, July 15th

Extrusion

"Some recent developments in extrusion," by A. Kennaway, *Imperial Chemical Industries Ltd., Plastics Div., Welwyn Garden City, England.*

"Developments of extrusion in Germany," by G. Schenkel, *Paul Troester Maschinenfabrik, Hannover-Wülfel, Germany.*

Tuesday, July 16th

Injection molding I

"The influence of preplasticisation in injection moulding," by E. Gaspar and M. G. Munns, *Projectile & Engineering Co. Ltd., London, England.*

Injection molding II

"The significance of rate injection in moulding," by L. W. Meyer and L. E. Tallman, *Dow Chemical Co., Midland, Mich., U.S.A.*

"A study of injection moulding of toughened polystyrene," by G. Hulse and A. Z. Borucka, *Monsanto Chemicals Ltd., London, England.*

Wednesday, July 17th

Material developments

"Recent developments in fluorine polymers," by G. W. Bowley, *Imperial Chemical Industries Ltd., Plastics Div., Welwyn Garden City, England.*

"Recent developments in arc resistant thermosetting moulding materials," by J. Hofton and C. P. Vale, *B. I. P. Chemicals Ltd., Birmingham, England.*

Glass-reinforced plastics

"Relative merits of epoxide, phenolic, and polyester resins in glass-reinforced plastics," by L. H. Vaughan, *Bakelite Ltd., Birmingham, England.*

"Reinforced plastics for efficient structures," by W. A. Baker, *Bristol Aircraft Ltd., Bristol, England.*

Exhibitors at the 4th British Plastics Exhibition

July 10-20, 1957. Grand Hall, Olympia, London, England

Non-British exhibitors' names are marked with asterisks. Numbers in parentheses indicate the stands (booths) occupied by each company. Except where otherwise noted, all addresses are in England.

Airothene Ltd., (C-9) 254 Euston Rd., London, N.W. 1.

***Algemene Kunstzijde Unie N.V.**, (D-4) Velperweg 76, Arnhem, Holland.

Anglo-American Plastics Ltd., (H-2) Ramillies Bldgs., Hills Pl., London, W. 1.

***Ankerwerk Gebr. Goller**, (K-28), Rennweg 37, Nurnberg, Germany.

Armstrong Whitworth (Metal Industries) Ltd., (K-18) Close Works, Gateshead upon Tyne 8, Durham.

Artrite Resins Ltd., (E-12) 56 Kingsway, London, W.C. 2.

Ashdowns Ltd., (J-11) Eccleston Works, Knowsley Rd., St. Helens, Lancs.

Asmidar Plastic Moulding Machines Ltd., (M-12) 5 Rampayne St., London, S.W. 1.

Associated Iliffe Press Ltd., (H-1) Dorset House, Stamford St., London, S.E. 1.

Bakelite Ltd., (K-2) 12-18 Grosvenor Gardens, London, S.W. 1.

Baker Perkins Ltd., (J-22) Westwood Works, Peterborough, Northants.

***Battenfeld**, (J-25) Meinerzhagen 1, Westf, Germany.

Baxenden Chemical Co. Ltd., The, (G-5) Clifton House, 83-117 Euston Rd., London, N.W. 1.

Beck, Koller & Co. (England) Ltd., (D-7) 110 Cannon St., London, E.C. 4.

B.I.P. Chemicals Ltd., (K-4) Popes Lane, Oldbury, Birmingham.

B.I.P. Eng. Ltd., (H-9) Streetly Works, Sutton Coldfield, Nr. Birmingham Works.

B.I.P. Tools Ltd., (K-14) 147 Tyburn Rd., Erdington, Birmingham 24.

Birkbys Ltd., (H-4) Liversedge, Yorkshire.

B.L.C. (Exports) Ltd., (L-19) 92 Baylis Rd., London, S.E. 1.

Boake Roberts & Co. Ltd., A., (E-9) Carpenters Rd., Stratford, E. 15.

Bone Bros. Ltd., (H-11) Manor Farm Rd., Alperton, Wembley, Middx.

Bradley & Turton Ltd., (H-8) Caldwall Works, Kidderminster, Worcs.

Bristol Aeroplane Co. Ltd., The (A-2) Filton House, Bristol, Glos.

British Celanese Ltd., (J-8) Celanese House, Hanover St., W. 1.

British Ermeto Corp. Ltd., (F-1) Beacon Works, Hargrave Rd., Maidenhead, Berks.

British Geon Ltd., (J-3) Devonshire House, Piccadilly, W. 1.

British Industrial Solvents (G-4) Devonshire House, Mayfair Pl., London, W. 1.

British Oxygen Chemicals Ltd., The (F-3) Bridgewater House, Cleveland Row, St. James's, S.W. 1.

British Paints Ltd., (D-2) Brittanic Works, Portland Rd., Newcastle upon Tyne 2.

British Plastics Federation, The (K-1) 47-48 Piccadilly, London, W. 1.

British Resin Prods. Ltd., (J-3) Devonshire House, Piccadilly, W. 1.

British Titan Prods. Co. Ltd., (D-11) York.

British Xylonite Co. Ltd., (L-3) Highams Pk., London, E. 4.

Burtonwood Eng. Co. Ltd., (J-24) Burtonwood, Warrington, Lancs.

***Buss Ltd.**, (K-28) Basle 2, Switzerland.

BX Plastics Ltd., (K-3) Higham Sta. Ave., Chingford London, E. 4.

Cascelloid (J-24) Abbey Lane, Leicester.

Cellgrave Co. Ltd., (J-13) Alpha House, Choumert Rd., London, S.E. 15.

Chemidus Plastics Ltd., (C-4) 89 Upper Thames St., London, E. C. 4.

Cole Ltd., E. K. (J-6) Ekco Works, Southend-on-Sea, Essex.

Collinsons' Precision Screw Co. Ltd., (L-20) Forest Rd., Walthamstow, E. 17.

Commercial Plastics Ltd., (H-2) 1 Avery Row, Grosvenor St., W. 1.

Commercial Solvents (G.B.) Ltd., (G-4) Devonshire House, Piccadilly, London, W. 1.

Courtaulds Ltd., (C-2) Ivy House, 30/32 Newgate St., E. C. 1.

Cosmocord Ltd., (M-1) Eleanor Cross Rd., Waltham Cross, Herts.

Crane Packing Ltd., (L-8) Slough, Bucks.

Crystalate Ltd., (J-7) Crystalate House, Mill Lane Tonbridge, Kent.

Daniels, T. H. & J. Ltd., (J-20) Lightpill Iron Works, Stroud, Glos.

Distrene Ltd., (J-3) Devonshire House, Piccadilly, London, W. 1.

De La Rue, Thos. & Co. Ltd., (E-6) 84/86 Regent St., London, W. 1.

Distillers Co. Ltd., (G-4) Devonshire House, Mayfair Pl., Piccadilly, W. 1.

Dohm Ltd., (E-7) 167 Victoria St., London, S.W. 1.

Dowding & Doll Ltd., (J-14) 346 Kensington High St., London, W. 14.

Durable Plastics Ltd., (A-6) Woodbridge Industrial Estate, By Pass Guildford, Surrey.

Duraplex Plastics Ltd., (L-6) Burwood House, 14 Caxton St., S.W. 1.

Ebonestos Industries Ltd., (J-7) Excelsior Works, Rollins St. Ilderton Rd., London, S.E. 15.

Edison Swan Electric Co. Ltd., The (G-7) 155 Charing Cross Rd., W.C. 2.

Ellison, George Ltd., (K-16) Perry Barr, Birmingham 22B, Warwicks.

Engis Ltd., (K-25) 25 Victoria St., London, S.W. 1.

Erinoid Ltd., (C-7) Lightpill Mills, Stroud, Glos.

Evans & Son, J. (Portsmouth) Ltd., (K-17) Marcyn Works, Goldsmith Ave., Portsmouth, Hants.

Extrudex Ltd., (E-3) Western Rd., Bracknell, Berks.

Ferguson, James & Sons Ltd., (F-4) Lea Park Works, Prince George's Rd., Merton Abbey, S.W. 19.

Fibreglass Ltd., (F-5) St. Helens, Lancs.

Finney Presses Ltd., (K-22) New Eagle Eng. Works, Berkley St., Birmingham 1.

Flexo Plywood Industries Ltd., (E-1) So. Chingford, London, E. 4.

Foster Yates & Thom Ltd., (J-19) Terminal House, Grosvenor Gardens, Westminster, S.W. 1.

Fothergill & Harvey (Sales) Ltd.,

(M-8) Harvester House, Peter St., Manchester 2, Lancs.

Fraser & Glass Ltd., (P-4) Woodside Lane, North Finchley, London, N. 12.

Geigy Co. Ltd., The (E-4) Rhodes, Middleton, Manchester, Lancs.

General Electric Co. Ltd., The (L-7) Magnet House, Kingsway, W.C. 2.

General Eng. Co. (Radcliffe) Ltd., (L-14) Sta. Works, Bury Rd., Radcliffe, Lancs.

Glass Fibre Mouldings Ltd., (P-8) Imperial Bldgs., Watery Lane, Birmingham 9.

Glass Yarns & Deeside Fabrics Ltd., (D-10) 56 Kingsway, London, W.C. 2.

Granbull Tool Co. Ltd., (J-18) 39 High St., Kingston, Surrey.

Greenwich Plastics Ltd., (K-7) St. Mary Cray, Kent.

Guest Keen & Nettlefolds (Midlands) Ltd., (G-9) Box No. 24 Heath St., Birmingham 19, Warwicks.

Halex Ltd., (L-3) Highams Park, London, E. 4.

Hedon Chemicals Ltd., (G-4) Devonshire House, Mayfair Pl., Piccadilly, London, W. 1.

Hellermann Ltd., (M-3) Crawley, Sussex.

Herbert, Alfred Ltd., (J-20) Red Lane Works, Coventry, Warwicks.

Holloway Dolls (London) Ltd., (P-9) 27 Church Crescent, London, N. 20.

***Holzverzucherungs**, (M-9) Talacker 16, Zurich, Switzerland.

Hupfield Bros. Ltd., (K-27) Dalston Gardens, Stanmore, Middx.

***Hydro-Chemie Ltd.**, (J-21) P.O. Box Zurich 22, Switzerland.

Imperial Chemical Industries Ltd., (J-4) Imperial Chemical House, Millbank, S.W. 1.

Industrial Appliances Ltd., (D-3) 21 Grosvenor St., London, W. 1.

Industrial Plastics Ltd., (J-23) 93 Regent St., London, W. 1.

***Industrie Riunite Sant 'Antonio S.p.A.** (P-10) Via Romagnosi 1, Milano, Italy.

Injection Moulders Ltd., (K-6) Westmoreland Rd., London, N.W. 9.

Insulating Components & Materials Ltd., (A-5) Alert Works, Willowbrook Rd., Peckham, S.E. 15.

Insulation Equipments Ltd., (H-6) Salop Rd., Oswestry, Shropshire.

Insulators Ltd., (L-4) Leopold Rd., Angel Rd., Edmonton, E. 18.

Ioco Ltd., (D-9) Netherton Works, Anniesland, Glasgow, W. 3.

Kemitype Ltd., (L-11) 8 Chase Rd., Park Royal, N. W. 10.

Kent Mouldings (J-1) Footscray, Sidcup, Kent.

Kenure, J. F., Ltd., (L-2) Faggs Rd., Feltham, Middx.

Kingsley & Keith Ltd., (P-11) 110/112 Victoria St., London, S.W. 1.

Kingston Mouldings Ltd., (M-7) 28 Gibbon Rd., Kingston, Surrey.

Kleestron Ltd., (L-5) West Halkin House, West Halkin St., Belgrave Sq., S.W. 1.

***Koch, Heinrich** (K-26) Siegburg, Germany.

Kodak Ltd., (G-2) Victoria Rd., Ruislip, Middx.

Lacrinoid Prods. Ltd., (D-6) Gidea Pk., Essex.

Lankro Chemicals Ltd., (L-1) Bentcliffe Works, Salters Lane, Eccles, Manchester, Lancs.

Latymer Eng. Co. (J-20) 27a Charles St., Barnes, London, S.W. 13.

Litholite Insulators & St. Albans Mouldings Ltd., (K-8) Sandown Rd., Watford, Herts.

Lloyds Bank Ltd., (M-6) Premises Dept., 71 Lombard St., E.C. 3.

London & Scandinavian Metallurgical Co. Ltd., (H-10) Wellington Works, Wellington Rd., Wimbledon, S.W. 19.

London Moulders (Plastics) Ltd., (K-12) 364 Buckingham Ave., Slough, Bucks.

Lowe, Chas. & Co. (Manchester) Ltd., (C-8) Harrogate Rd., Reddish, Stockport, Cheshire.

Lustroid Ltd., (C-10) Southdown Works, Kingston Rd., Raynes Pk., S.W. 20.

M. & B. Plastics Ltd., (A-1) Dagenham, Essex.

***Machine Factory & Foundry Ltd.**, (L-9) Netstal, Switzerland.

Mange Plastics Ltd., (L-8) 39/41 Margravine Rd., London, W. 6.

Marley Tile Co. Ltd., The (E-11) London Rd., River Head, Sevenoaks, Kent.

Marston Excelsior Ltd., (J-12) Fordhouses, Wolverhampton, Staffs.

Melwood Thermoplastics Ltd., (C-1) Willoughby Rd., Harpenden, Herts.

Mersey Cable Works Ltd., (L-8) Linacre Lane, Booth, Liverpool 20, Lancs.

Metal Box Co. Ltd., The (G-3) The Langham, Portland Pl., London, W. 1.

Metropolitan-Vickers Electrical Co. Ltd., (K-20) Trafford Pk., Manchester 17, Lancs.

Mica Prods. Ltd., (J-7) Crystalate House, Mill Lane, Tonbridge, Kent.

Microcell Ltd., (K-10) 56 Kingsway, London, W.C. 2.

Milford-Astor Ltd., (L-17) 107 Crawford St., London, W. 1.

Monsanto Plastics Ltd., (K-9) Monsanto House, Victoria St., W. 1.

***Morton Machine Co. Ltd.**, (K-23) Atlantic Works, Wishaw, Scotland.

National Plastics (Sales) Ltd., (K-11) Ave. Works, Walthamstow Ave., E. 4.

***Negri Bossi & Co.** (L-12) Corso Magenta 44, Milano, Italy.

Novadel Ltd., (P-7) St. Ann's Crescent, Wandsworth, London, S.W. 18.

Omni (London) Ltd., (J-17) 35 Dover St., London, W. 1.

Peco Machinery Sales (Westminster) Ltd., (J-16) 28 Victoria St., London, S.W. 1.

Pendry (Plastics) Ltd., (A-4) "Bridge Works," Brentfield Rd., Willesdon, N.W. 10.

Permanoid Ltd., (M-4) Vincent Works, New Islington, Manchester 4, Lancs.

Perstorp Prods. (Gt. Britain) Ltd., (B-7) 110 Cannon St., London, E.C. 4.

Petrochemicals Ltd., (C-7) Partington Industrial Estate, Urmston, Manchester, Lancs.

Philips Electrical Ltd., (C-6) Century House, Shaftesbury Ave., London, W.C. 2.

Phillips Bros. & Ellis Ltd., (P-13) 45 St. Pauls Churchyard, London, E.C. 4.

Phoenix Rubber Co. Ltd., (F-2) 91 Bishopsgate, London, E.C. 2.

Plastic Tool Co. Ltd., The (L-16) 63 Dalwood St., Camberwell, London, S.E. 5.

Prestfibre Ltd., (P-16) 359 Canal Rd., Bradford 2, Yorkshire.

Projectile & Eng. Co. Ltd., The (J-16) Acre St., Battersea, S.W. 8.

Punfield & Barstow (Mouldings) Ltd., (B-4) Basil Works, Westmoreland Rd., Queensbury, N.W. 9.

Radio Heaters Ltd., (K-13) Eastheath Ave., Wokingham, Berks.

Redifon Ltd., (H-12) Carlton House, Lower Regent St., S.W. 1.

Rediweld Ltd., (H-12) 15-17 Crompton Way, Crawley, Sussex.

Reeves & Sons Ltd., (M-2) Lincoln Rd., Enfield, Middx.

***Reifenhauser, A.** (J-25) Troisdorf, West Germany.

Resinous Chemicals Ltd., (D-2) Blaydon, Co. Durham.

Richoux, L. Co. (London) Ltd., (M-5) 32 Finsbury Sq., London, E. C. 2.

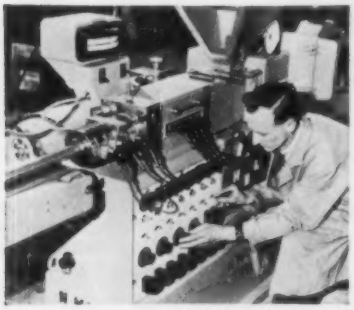
Roberts, J. W., Ltd., (P-1) Armley, Leeds 12, Yorks.

Rosedale Assoc. Mfrs. Ltd., (L-10) 11 Upper Grosvenor St., London, W. 1.

(*To page* 198)

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Saro Laminated Wood Prods. Ltd., (H-3) Follyworks, Whippingham, East Cowes, I.O.W.

***Schwalbach Kg., Alfred** (H-14) Blucherstr 35/37, Hamburg-Altona, Germany.

Scott Bader & Co. Ltd., (J-9) Wollaston, Wellingborough, Northants.

Schubert, H. Ltd., (B-8) Imperial Works, Wenlock Rd., London, N. 1.

Shaw, Francis & Co. Ltd., (K-21) Corbett St., Ashton New Rd., Manchester 11, Lancs.

Shell Chemical Co. Ltd., (C-7) Norman House, 105/109 Strand, London, W.C. 2.

Sheridan Croxted Ltd., (G-1) 296-302 High Holborn, London, W.C. 1.

Shipton, E. & Co. Ltd., (D-3) Ferndown, Northwood Hills, Middx.

Siemens Bros. & Co. Ltd., (G-7) 38 & 39 Upper Thames St., E.C. 4.

Simmonds Aerocessories Ltd., (L-18) Treforest, Pontypridd, Glam.

***Skanska Attikfabriken** (B-7) Sweden.

Slingsbuy, H. C. Ltd., (A-3) 89-97 Kingsway, London, W.C. 2.

Small Power Machine Co. Ltd., The (L-21) 4 Sunleigh Parade, Wembley, Middx.

***Societe Anonyme Isobelec** (D-12) 14 Quai Timmerman Sclessin, Belgium.

***Societe de L'Electronique Francaise**, (G-10) 26 Rue Malakoff, Asnieres (Seine) France.

Stanley Plastics Ltd., (G-6) Hambrook, Chichester, Sussex.

Stanley Smith & Co. (F-6) Worple Rd., Isleworth, Middx.

Storey Bros. & Co. Ltd., (H-5) White Cross, Lancaster.

Streetly Mfg. Co. Ltd., The (J-10) Streetly, Sutton, Coldfield, Nr. Birm.

Suntex Safety Glass Industries Ltd., (D-1) Suntex Estate, Thorney Lane, Iver, Bucks.

Styrene Prods. Ltd., (C-7) 96/7 Piccadilly, London, W. 1.

Talbot Tool Co. Ltd., (M-10) 87 Borough High St., London, S.E. 1.

***Tavannes Machines Co. S. A.**, (J-21) Tavannes, Switzerland.

Telcon Works, (E-5) Greenwich.

Telegraph Construction & Maintenance Co. Ltd., The (E-5) Telcon Works, Christchurchway, Greenwich, London.

Tellus Super Vacuum Cleaner Ltd., (P-15) 39 Sheen Lane, Mortlake, London, S.W. 14.

Temple Press Ltd., (B-5) Bowling Green Lane, London, E.C. 1.

Tenaplas Ltd., (C-3) Upper Basildon, Nr. Pangbourne, Berks.

Thermo Plastics Ltd., (K-5) Luton Rd. Works, Dunstable, Beds.

Tilghman's Ltd., (M-11) 1 Chester St., London, S.W. 1.

Tintometer Ltd., The, (G-11) The Colour Laboratory, Waterloo Rd., Salisbury.

***Triulzi, A.** (K-24) Milan, Italy.

Tube Investments Ltd., (L-8) 39-41 Margravine Rd., London, W.6.

Tufnol Ltd., (J-5) Perry Barr, Birmingham 22B.

Turner Bros. Asbestos Co. Ltd., (J-2) Rochdale, Lancs.

United Coke & Chemicals Co. (C-5) 34 Collegiate Crescent, Sheffield 10, Yorks.

United Ebonite & Lorival Ltd., (D-5) Little Lever Nr. Bolton, Lancs.

Utilex Ltd., (C-7) Mill St. Kingston-on-Thames, Surrey.

Vacuum Metallurgical Developments Ltd., (P-14) c/o Dowson & Mason Ltd., Alma Works, Levenshulme, Manchester 19, Lancs.

***Vacuum Industrial Applications Ltd.**, (J-15) Netherton Rd., Wishaw, Lanarkshire, Scotland.

Vinyl Prods. Ltd., (D-7) Butter Hill, Carshalton, Surrey.

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Warerite Ltd., (K-2) Wotton Rd., Ware, Herts.

Wallington Weston & Co. Ltd., (E-11) Frome, Somerset.

West Instrument Ltd., (G-8) 52 Regent St., Brighton 1, Sussex.

Whiffen & Sons Ltd., (P-2) North West House, Marylebone Rd., London, N.W. 1.

Wickman Ltd., (K-19) P.O. Box No. 36, Fletchamstead Highway, Coventry, Warwicks.

Williams (Hounslow) Ltd., (H-7) Hounslow, Middx.

Wilmot Breeden Ltd., (E-8) Amington Rd., Birmingham 25, Warwicks.

Windsor, R. H. Ltd., (K-15) Leatherhead Rd., Chessington, Surrey.

Winkworth Machy. Ltd., (L-15) 65 High St., Staines, Middx.

W. S. Electronics (Extruders) Ltd., (L-13) Brunel Rd., East Acton, W. 3.

Yorkshire Copper Works Ltd., The, (D-8) Leeds 10, Yorkshire.

***Zimmer, Hans J.**, (J-21) Borsigallee 1/3, Frankfurt Main, Germany.

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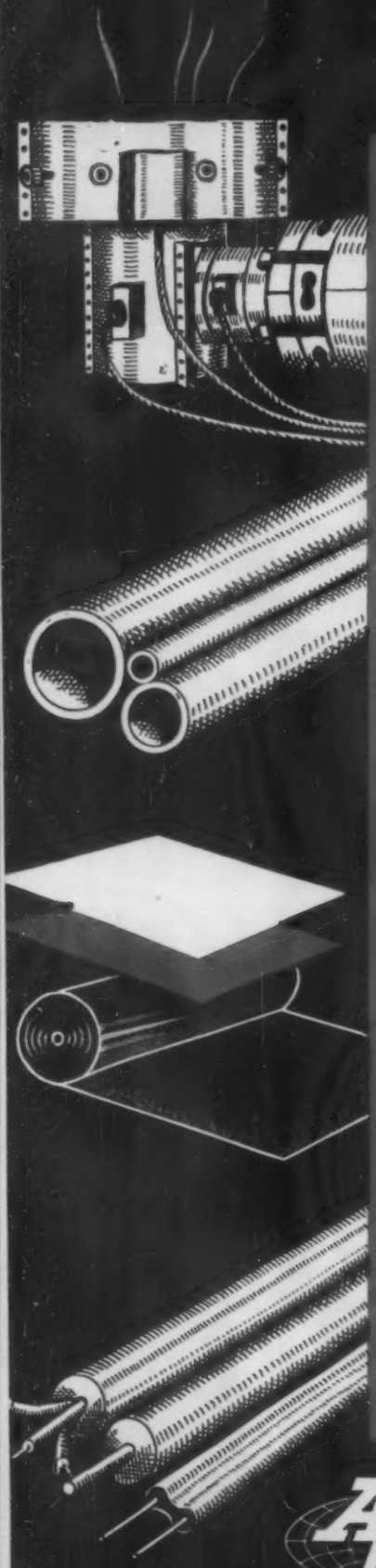
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Drive

The drive is effected by a self- and externally-cooled commutator A. C. shunt-wound motor, with infinitely variable controllable speeds . . . two screw speed ranges . . . all rotating parts run in ball bearing races . . . lubricating oil is circulated under pressure by a special gear pump, and a magnetic filter purifies the oil of both metallic and non-metallic impurities.

Specification of the S 90/RGV

Screw diameter (= D)	3.58" approx.
Screw length	15 D.
Screw Speeds	
Infinitely variable by means of AC Shunt-motor	
Speed Position I	9 - 34 r.p.m.
Speed Position II	17 - 63 r.p.m.
Motor for Screw	
Standard	30 h.p.
Special	38 h.p.
Output	
of Extruder (working averages)	88-265 lb/H

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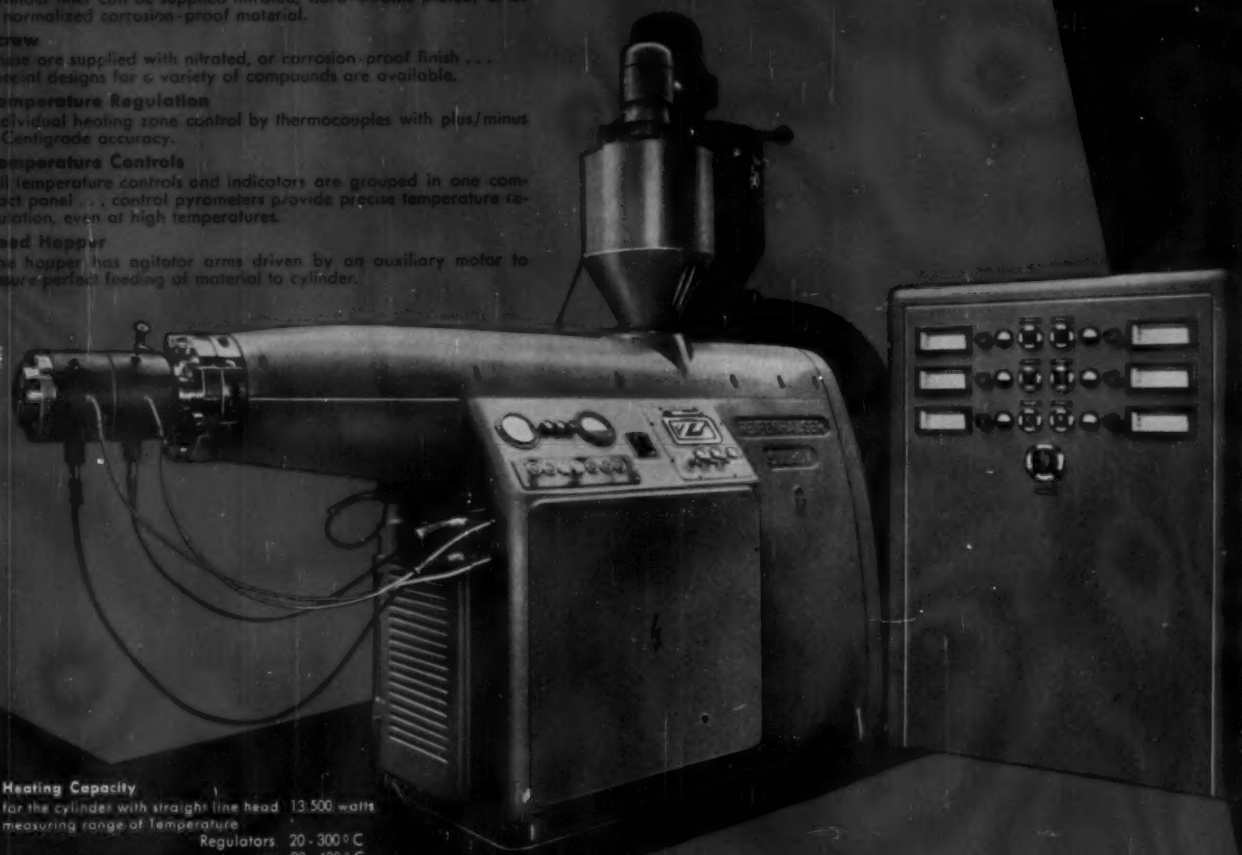
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Individual heating zone control by thermocouples with plus/minus 1 Centigrade accuracy.

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or	20 - 400° C
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sea space when packed	about 35 ft³
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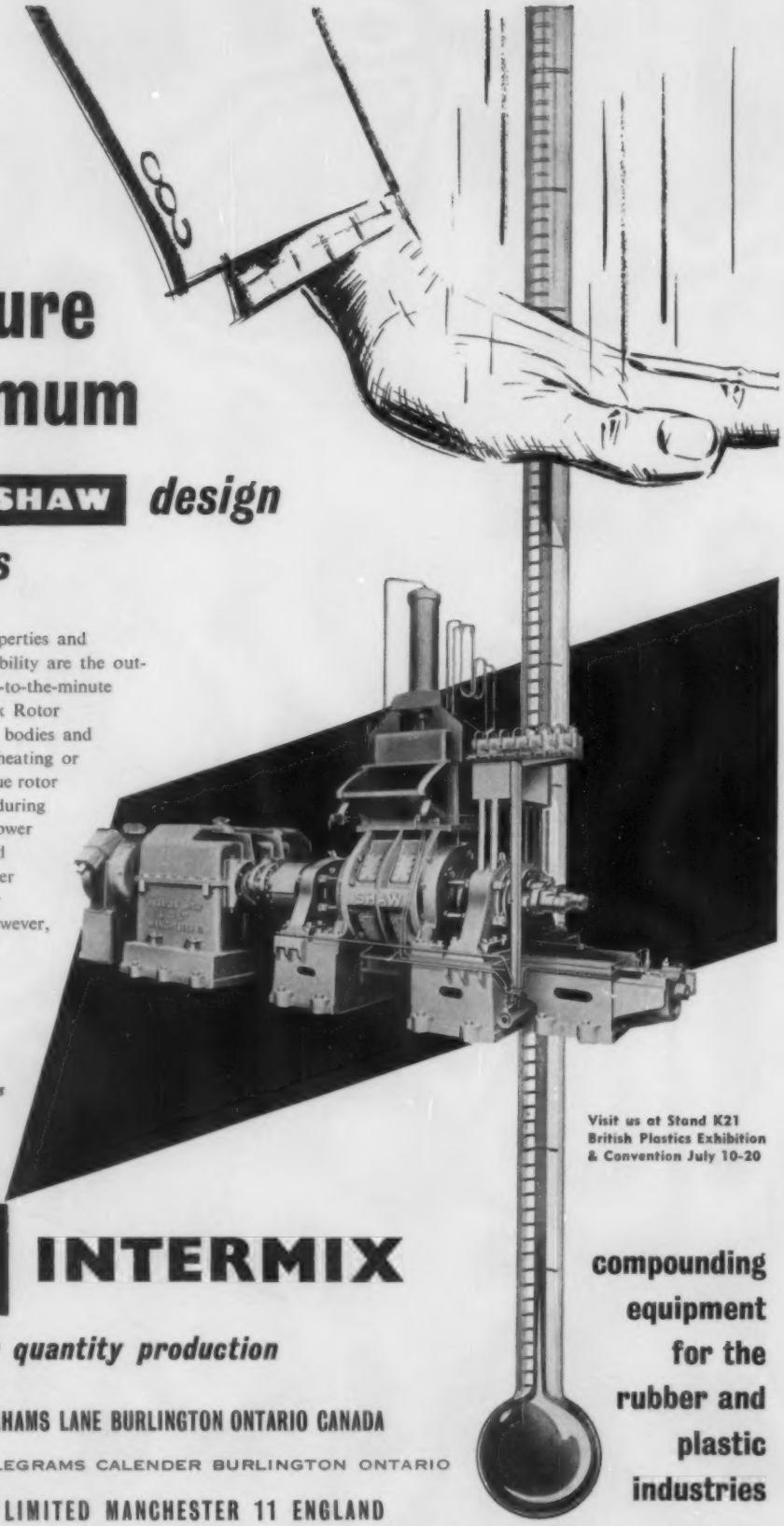
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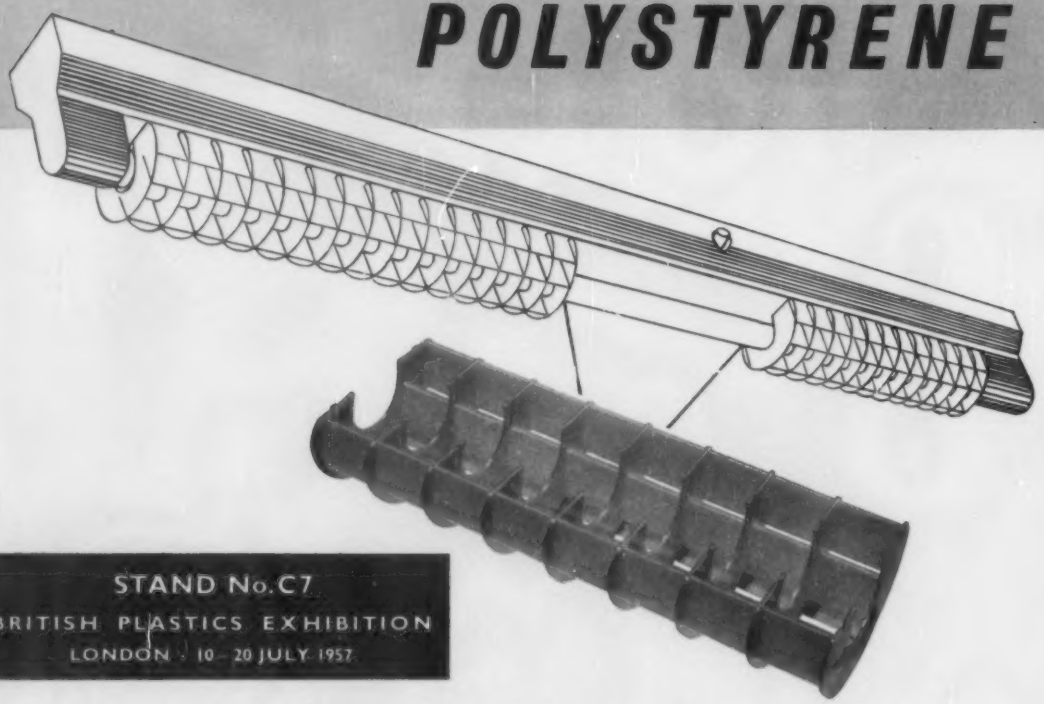
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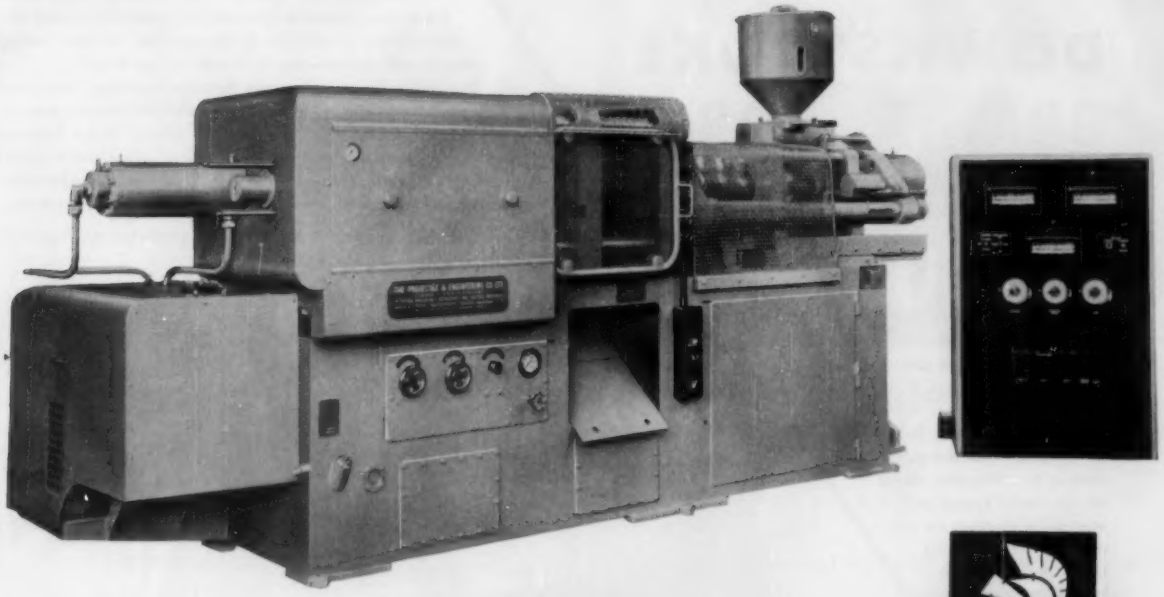
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Injection Moulding Machines

1/2 oz.—160 oz. capacity fitted with conventional or pre-plasticising injection units.



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250 TON PRESS



100 TON PRESS

DOWNSTROKE PRESSES FOR REINFORCED PLASTICS

These presses are specially for polyester/glass or asbestos/phenolic or epoxy resins. The 250-ton press shown has a table size 8 ft. x 5 ft., daylight 8 ft. and stroke 4 ft. Vickers pumping equipment is mounted on the head and the rate of closing is adjustable down to very slow speed at any point desired on the stroke. The tables have tee slots for mould securing and are water cooled.

We are pleased to announce that we have acquired the manufacturing and selling rights from Latymer Engineering Company of their

VACUUM FORMING MACHINES

The development of Vacuum Forming opens up great possibilities in the field of packaging and display, and the 'Blister Pack' in which the Plastic Sheet is moulded to provide a transparent cover for the article or articles to be packed, is now being employed extensively in a variety of trades.

Daniels-Latymer Automatic Vacuum Forming Machines may be equipped with a special Roll-Feed attachment to allow the continuous production of Blister Packs from a roll of film. Dual controls are provided to allow the manual operation of each sequence in the cycle for experimental purposes and to determine the correct setting of the controls.

Fully illustrated leaflets are available on request.



MODEL AUTO. 30/30 for sheet 26" x 26". Overall dimensions: 3' 8½" x 6'1¼" x 6' 8". Weight approx. 980 lb. (445 kg.) Can be fitted with Roll-Feed attachment for continuous 'Bubble Pack' production. (Illustrated.)

T.H.&J. DANIELS LTD

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what is the cost of corrosion?



Photograph by courtesy of Turner and Brown Ltd.

Corrosion is one of industry's most costly enemies, eating away profits as it eats away plant. The money lost by corrosion, in the United States alone, runs into millions of dollars every year!

Why manufacturers use COBEX

No other synthetic construction material combines the chemical resistance of COBEX with such ease of fabrication and low manufacturing cost.

COBEX is a British rigid vinyl sheet, outstandingly resistant to chemical attack, and used by well-known industrial concerns all over the world, for exhaust ductings, tank linings, fans and fume scrubbing equipment. It is light, easily fabricated and hot-gas welded, yet extremely strong; dimensionally stable, highly moisture resistant, and non-inflammable.

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COBEX, laminated with VELBEX P.V.C Sheet, facilitates adhesion to wood or metal surfaces, improves impact strength, and lowers the amount of static charge collected.

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DOWDING AUTOMATIC Series II
INJECTION MOLDING MACHINES



Send for details of the
NEW DOWDING Series II Machines

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101

SOLVIC COPOLYMERS

The following three materials are vinyl chloride — vinyl acetate suspension copolymers.

SOLVIC 513 P — Vinyl acetate content: ± 15%. PROPERTIES — Working temperatures: low; flow temperatures: very low (allows injection moulding without plasticizer). USES — LP records, vinyl-asbestos floor-tiles.

SOLVIC 523 K — Vinyl acetate content: ± 10%. PROPERTIES — Can be processed at low temperatures; easily produces clear sheeting or sheeting with transparent colours; permits extreme draws when made into sheeting for vacuum forming. USES — Rigid opaque, tinted or clear sheeting, deep vacuum forming.

SOLVIC 535 E — Vinyl acetate content: 5%. USES — General purpose copolymer.

SOLVIC POLYVINYLCHLORIDES

SOLVIC 100 series (122, 124, 136)
General- and special-purpose PVC resins, manufactured by the emulsion process; suitable for unplasticized extrusion and calendering, for blow-extrusion of unplasticized films, for injection moulding of unplasticized articles; Solvic 122 is prestabilized with non toxic products.

SOLVIC 200 series (235, 228, 235D)
General- and special-purpose PVC resins, manufactured by the suspension process; suitable for extrusion and calendering of plasticized articles; having excellent dielectric properties, Solvic 235 D is used for cable insulation.

SOLVIC 300 series (334, 336)
Paste-making PVC resins (plastisols and organosols); suitable for coating of fabrics and paper, dipping, hollow casting or slush molding, and soft cellular products.

Solvic is presently supplying PVC and copolymers in large quantities to plastic users throughout the world. In addition, Solvic manufactures PVC compounds and colour concentrates (master-batches) under the trade name, BENVIC.

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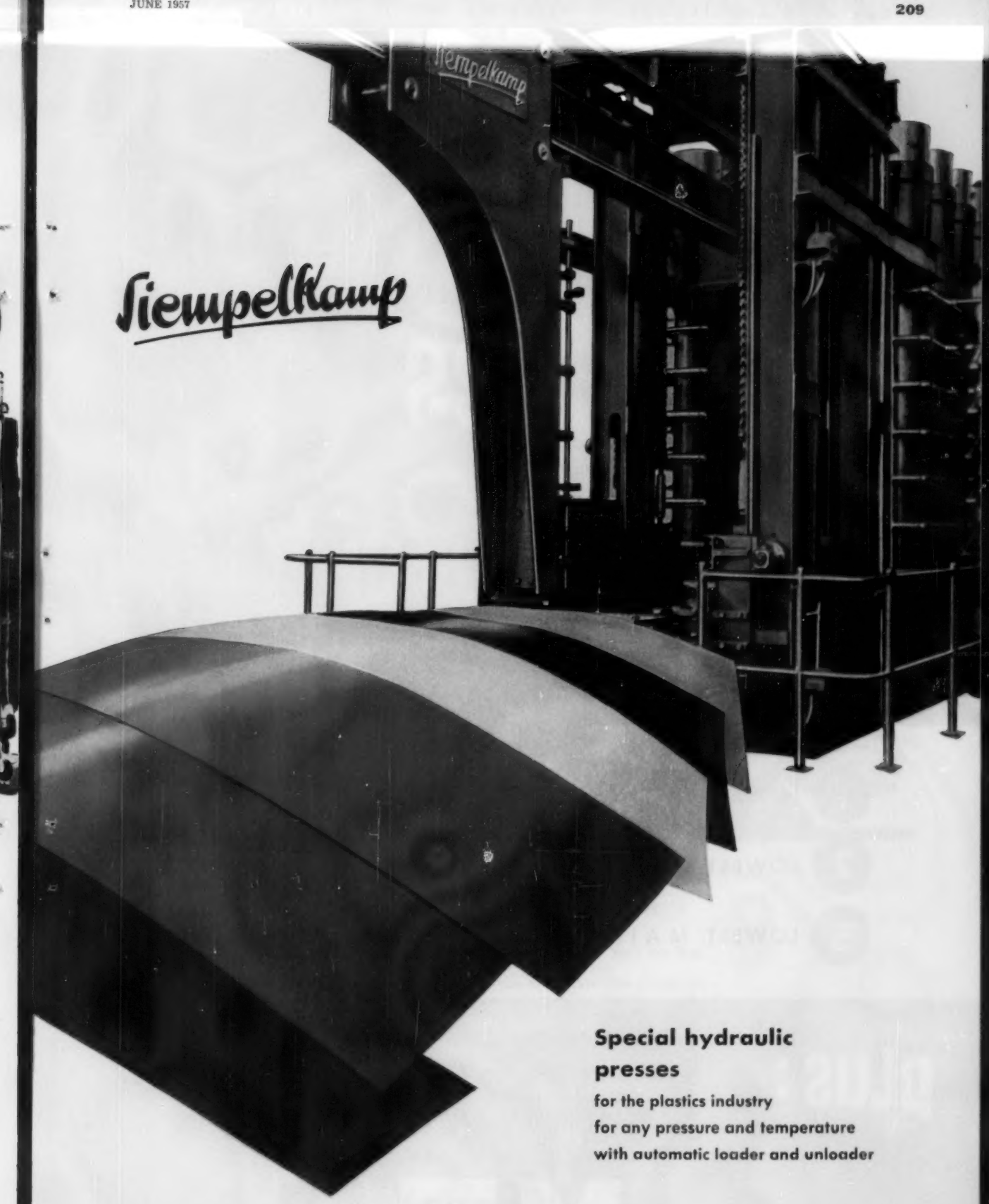
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for all pressures and temperatures

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2 LOWEST OPERATING COST

3 LOWEST MAINTENANCE COST

plus:

- FULLY AUTOMATIC MOLDING
- WEIGHT FEEDERS AS STANDARD EQUIPMENT
- TWO SEPARATE MOLD PROTECTION SYSTEMS

SOLD AND SERVICED BY MOLDING SYSTEMS INC. DANIELSON, CONNECTICUT



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STAND NO. L5
Grand Hall, Olympia
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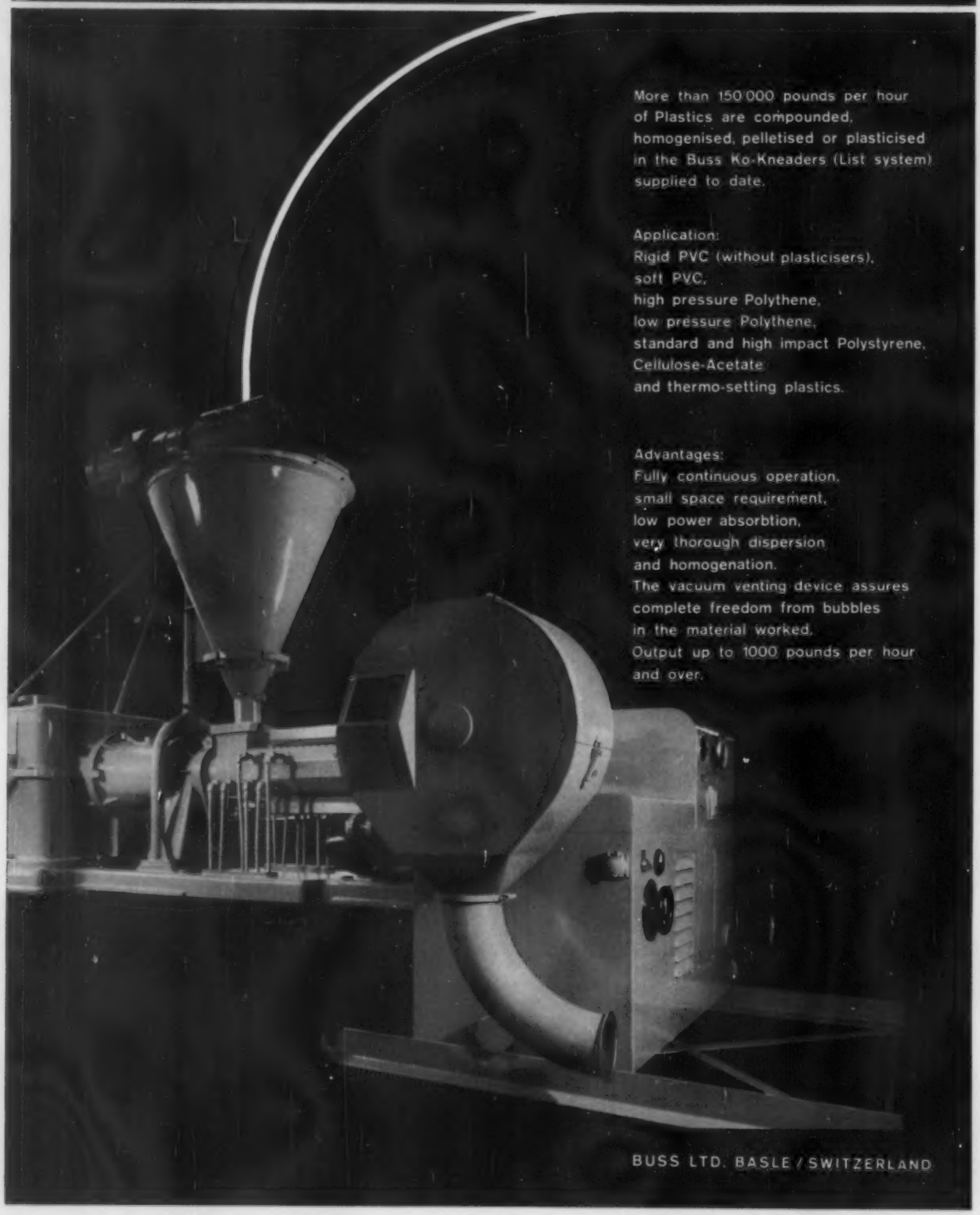
DO YOU PLAY YOUR LUCK?

Of course you have to play a hunch now and again, life's like that. And good luck to you—so long as you never leave vital things like choosing injection moulding and extrusion materials to chance. There's no excuse for anything but accuracy there—and there's little doubt you'll find the polystyrene that's 100% right for the job in the Kleestron range. Why not take advantage of our experience and resources—and find out? All you have to do is write or phone us: Kleestron Limited, West Halkin House, West Halkin Street, London, S.W.1. Tel: SLOane 0866.

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make a comprehensive range of general polystyrenes and impact materials—and will gladly supply technical details, prices, etc.

Buss Ko-Kneader

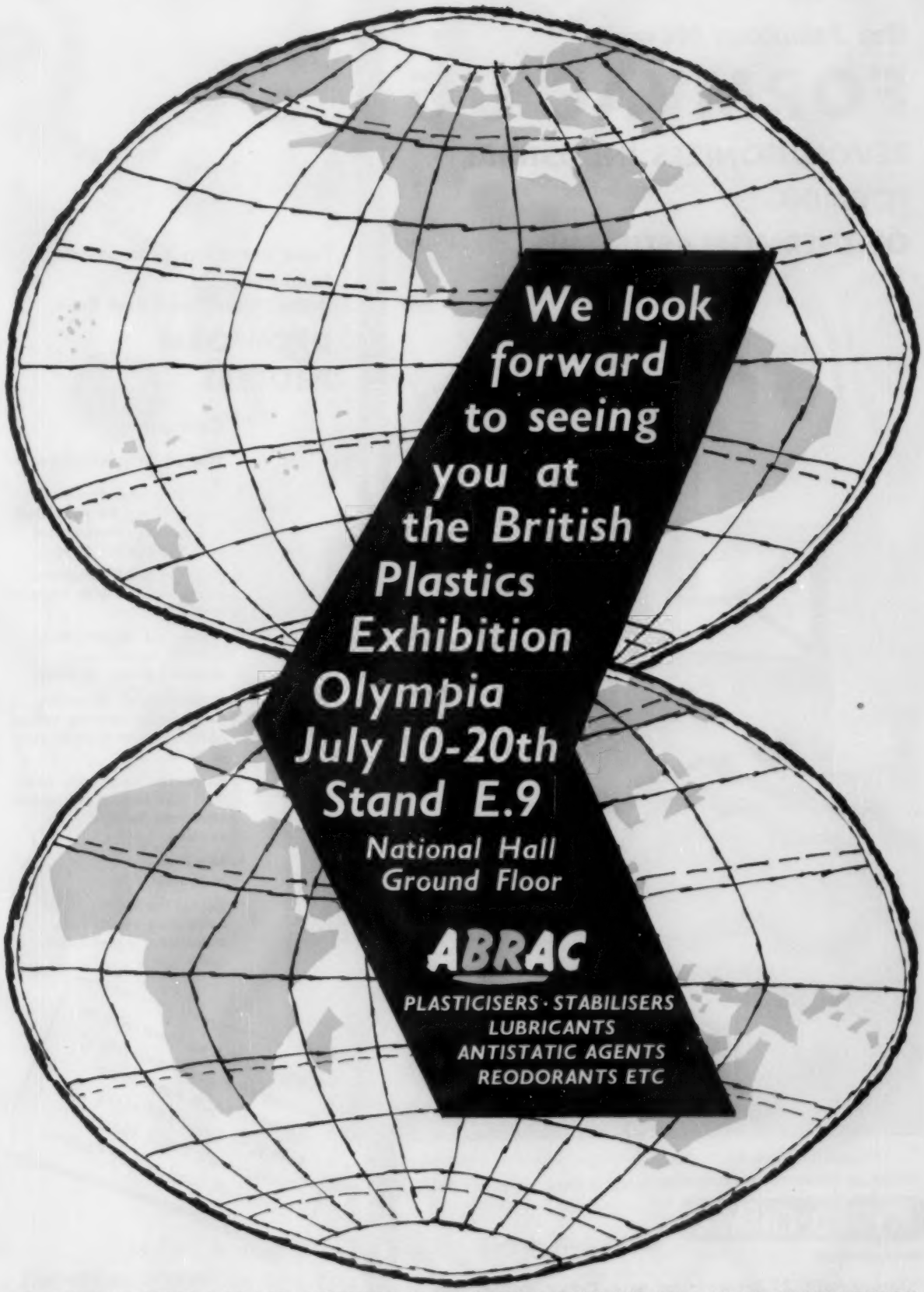


More than 150 000 pounds per hour of Plastics are compounded, homogenised, pelletised or plasticised in the Buss Ko-Kneaders (List system) supplied to date.

Application:
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soft PVC,
high pressure Polythene,
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standard and high impact Polystyrene,
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and thermo-setting plastics.

Advantages:
Fully continuous operation,
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very thorough dispersion
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The vacuum venting device assures complete freedom from bubbles in the material worked.
Output up to 1000 pounds per hour and over.

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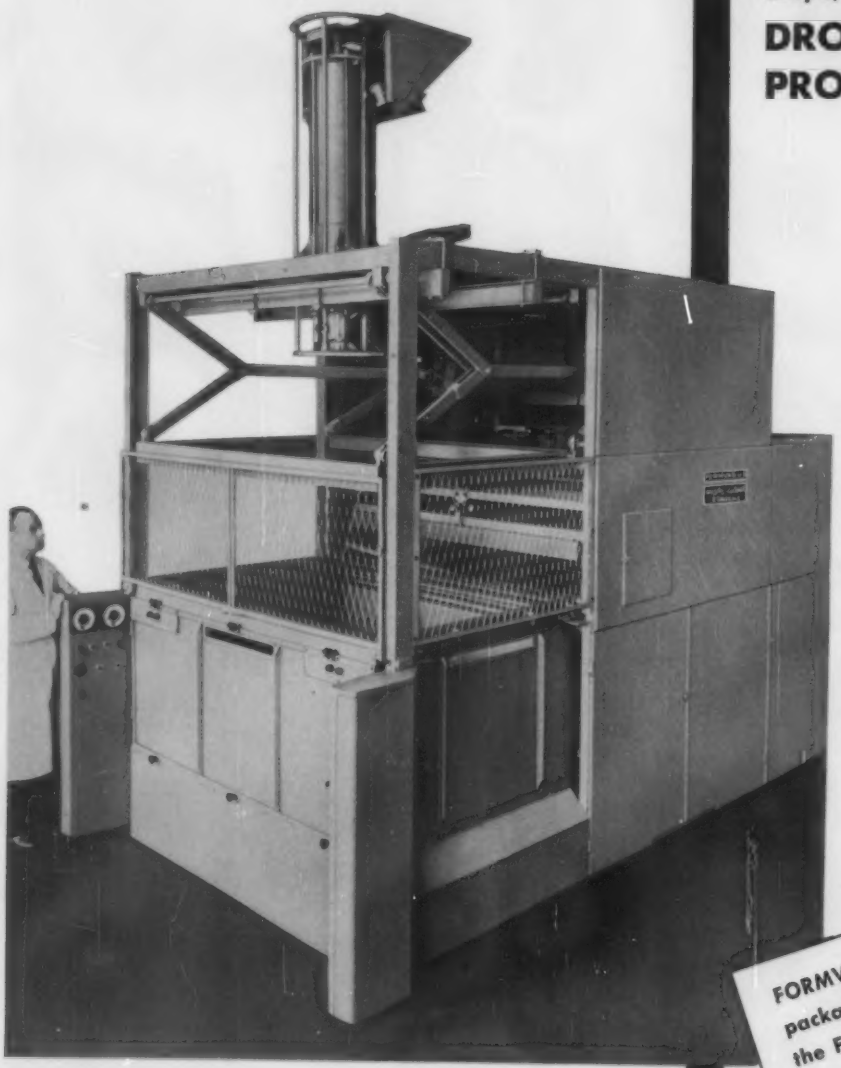


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FORMVAC U-5

REVOLUTIONIZES INDUSTRIAL FORMING OF THERMOPLASTIC SHEET



Four forming processes:
Deep-draw,
drape, AIRSLIP and now the

DROPFORM PROCESS

Compare these highlights —

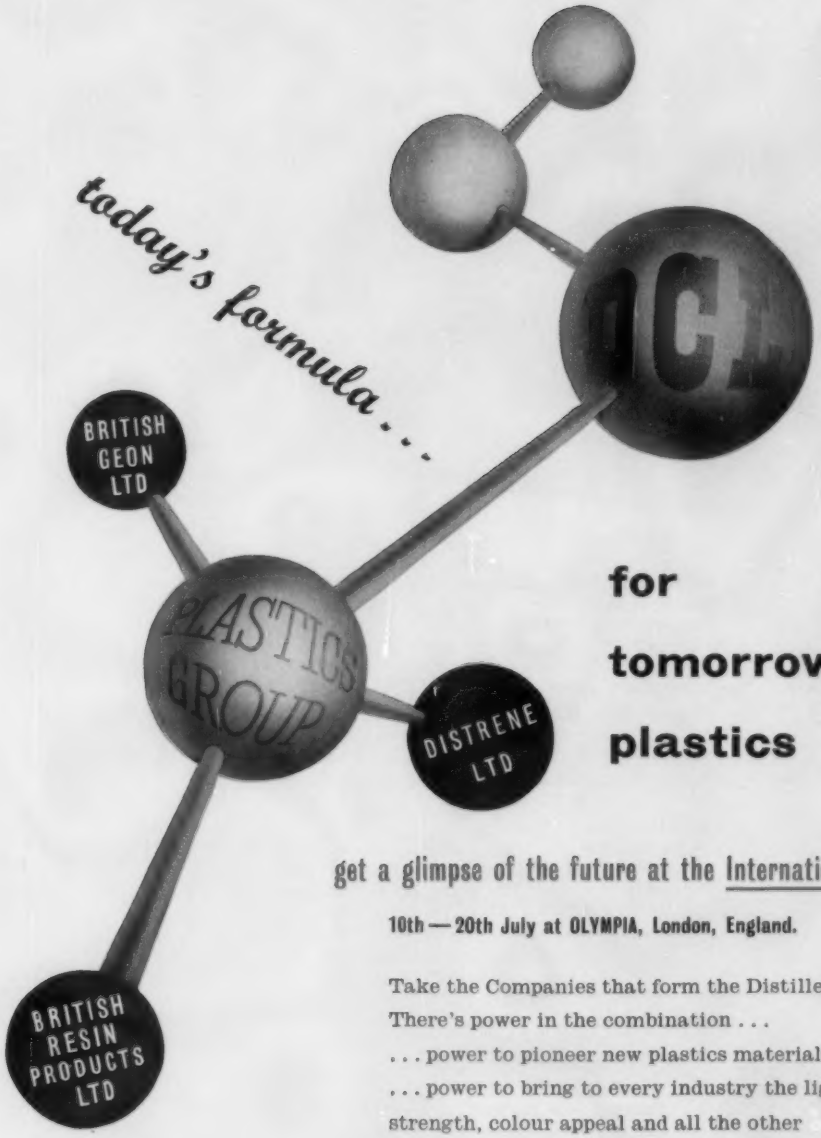
- Full area and depth capacity can be exploited —U-5 forms rectangular tank 40x60x24" deep.
- Extreme depth-diameter ratios formed with uniform wall thickness.
- Combined DROPFORM/ AIRSLIP forms deep double-walled sections.
- Double-sided radiation gives faster heating cycles, handles sheet gauges up to ⅜".
- Extensive pneumatic controls give fastest action and eliminate breakdown sources.
- Maximum safety features to protect operator.
- Except for loading and unloading sheet, fully automatic, preselected cycle.

FORMVAC U-5 on show with its packaging industry counterpart, the FORMPACK Automation Rotary, on Stand J 21 at the International British Plastics Exhibition, London, July 10-20th.

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Incorporated
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Cables: HYDROCHEMIE ZURICH

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for tomorrow's plastics

get a glimpse of the future at the International British Plastics Exhibition

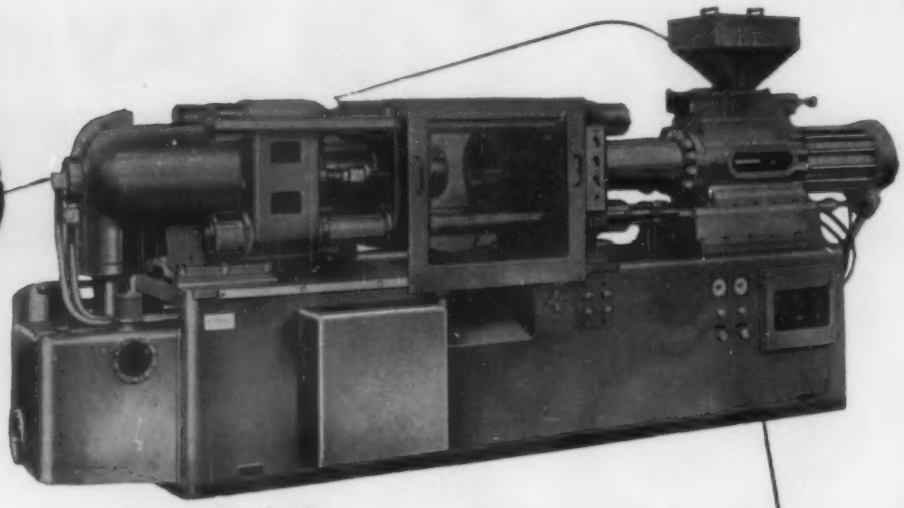
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There's power in the combination . . .
. . . power to pioneer new plastics materials
. . . power to bring to every industry the lightness,
strength, colour appeal and all the other
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At their factory at Barry, Glamorgan, British Resin Products Ltd.,
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At Barry, too, their laboratories are conducting research
over an ever widening field of plastics technology.
The fruits of this enterprise, and some prospects
for the future will be displayed on Stand No. J3.
If you cannot attend the exhibition and wish to know something more
of our activities, please write for booklet M/P.

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INJECTION MOULDING PRESSES



These Machines mean BUSINESS for you

Injection Presses
Negri Bossi injection presses feature maximum serviceability—cylinder, screw, nozzle, and heaters can be removed as units by just one person. Main components are interchangeable. All machines are equipped with oildynamic power drive unit and a special safety device. Model NB 360/520, 12 to 19 oz. capacity shown above.

"Rapid" Fully Automatic Injection Presses
Another example of Negri Bossi progress in automation, the "Rapid" series provides fully automatic, rapid-cycling operation. Models available with 1, 2, 4, 6 oz. capacities.

Extruders
Negri Bossi single screw extruders are available in the "Standard" series with 1 3/16, 1 7/8, 2 3/8 screw diameters, and the "TV" series of variable-speed models with 1 7/8, 2 3/8, 2 3/4, 3 1/2 inch diameters. Screw and die heads are available in a variety of designs for such applications as tubing, profiles, wire coating, monofilaments, and for extruding and blowing PVC and polyethylene tubular films.

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Patented movable and adjustable infrared heater elements concentrate heat where it is needed most, ensuring constant cross-sections throughout the formed piece and permitting extremely deep draws.
Negri Bossi features automatic and semiautomatic machines—both lines providing high quality performance.

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Quality controlled 'deeglas'
in this all-plastic u.d. milk float



This all-plastic milk float, manufactured by Mickleover Transport Ltd. for United Dairies, employs **deeglas** chopped strand mat as its sole reinforcing material.

All **deeglas** products, chopped strand mat, glass rovings and deeformat, are produced under a quality control system based on the requirements of BS.600 and BS.600R. This ensures the consistency so essential for perfect mouldings.



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★ SUITABLE FOR WORKING THERMO-PLASTICS CELLULOSE ACETATE, POLYSTYRENE, POLYTHENE, with normal cylinder—NYLON special cylinder.

★ CAPABLE OF PRODUCTION RATES, depending upon mould design, UP TO 100 INJECTIONS PER HOUR WITHOUT SPECIAL SKILL.

and TWO totally NEW FEATURES

★ FITTED WITH NEW LEAKPROOF, SELF-SEALING AND INTERCHANGEABLE CYLINDER UNIT (Patented).

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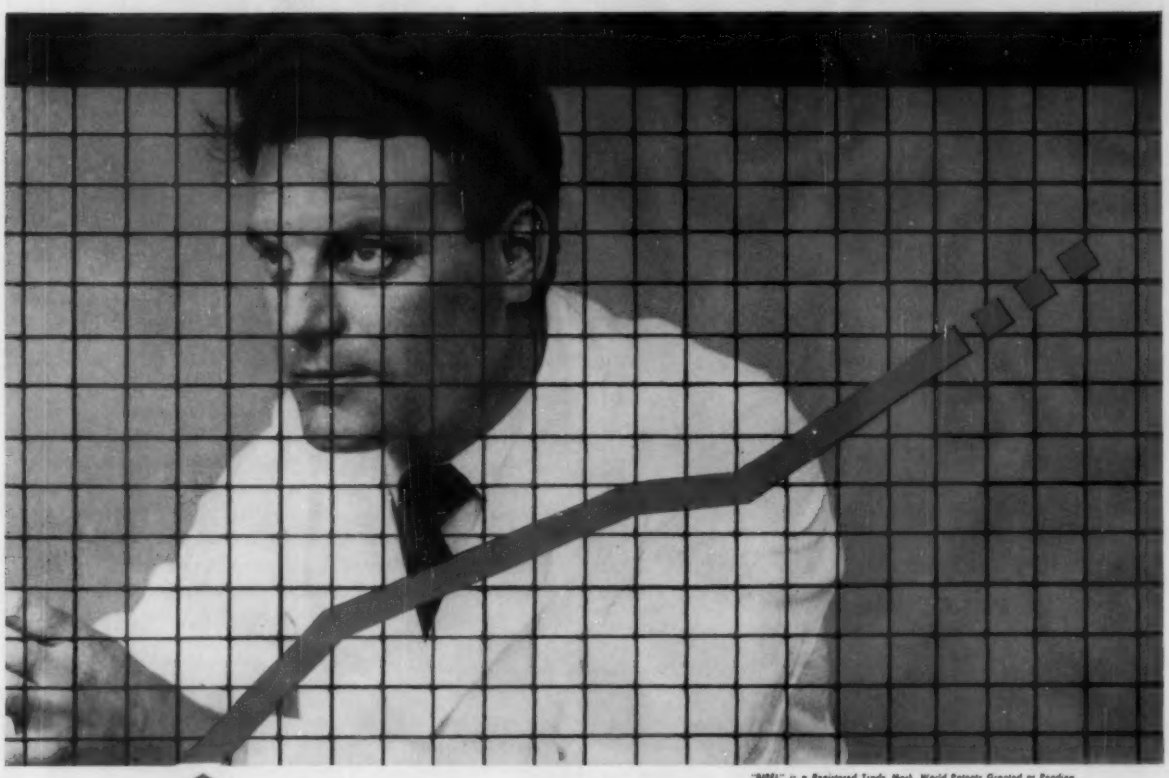
British plastics exhibition

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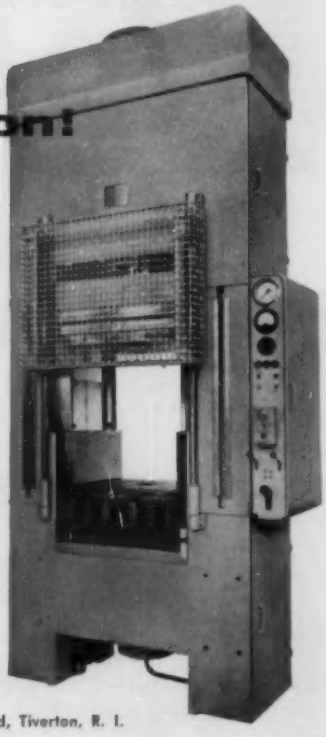
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DOWN comes this BIPEL guard-



"BIPEL" is a Registered Trade Mark. World Patents Granted or Pending.

UP goes your production!



Each time your BIPEL automatic guard drops, your production surges ahead at an unmatched rate! Auto-Control spells the difference: precise automatic reproduction of *any required molding cycle* . . . at the touch of a button! Your reward? Extra cycles per hour, virtually no rejects, no over-cured molds to clear, economical installation and maintenance. Get *all* the facts first. You'll surely choose BIPEL!

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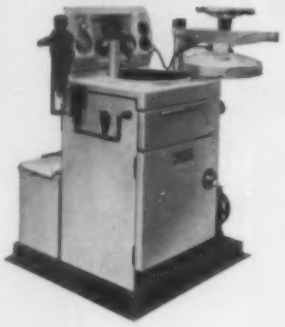
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Type BV coiling machine

Type LVO measuring machine and cutting attachment

Type F marking machine

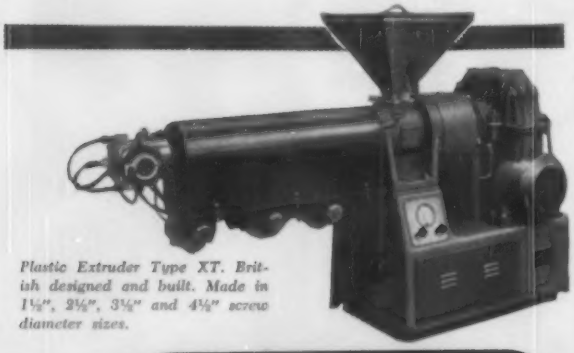
Type P 14 packaged impregnating plant

Kinney rotary high vacuum pump GKS47

Packaged High Vacuum Impregnating Plant Type P 14

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Plastic Extruder Type XT. British designed and built. Made in 1½", 2½", 3½" and 4½" screw diameter sizes.

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IT'S A BIG MARKET FOR PLASTICS!

"Big Market," is right! The men who select the materials used to package the output of America's biggest industries control a market that will hit the 15 billion dollar mark this year.

Typical of the 45 industries that comprise this rich market are companies which manufacture and package foods, cosmetics, chemicals, drugs, candies and tobacco products. In all these highly competitive industries frequent packaging changes are the order of the day. Factors ranging from fascinating sales appeal to plain hard costs influence the men who make the packaging decisions. Consequently, no one type of packaging material (glass, metal, paper or fabric) ever has assurance that it won't be supplanted by another.

And now plastics have entered the arena as directly competitive materials for packaging. In just the last few years they have come to play an increasingly important role—and often at the expense of older, "traditional" materials.

Especially noteworthy is the fact that plastics can be used in the manufacture of almost every basic package type: box, bag, bottle, drum, jar, vial or collapsible tube!

Right now this frontal invasion of the packaging field by alert plastics manufacturers, molders, laminators and fabricators has just begun. And their chief sales tools are the two publications which reach the men who make packaging decisions in all 45 industries—MODERN PACKAGING Magazine, issued monthly, and the annual MODERN PACKAGING ENCYCLOPEDIA ISSUE.

Free Details about the Market

Additional data on using these media to help expand your sales to the packaging market are contained in the booklet "The Packaging Field—and how to reach it." Write for your free copy.

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MODERN PACKAGING

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NOW MADE IN BRITAIN

'CRAYTHERM'

NON-TOXIC

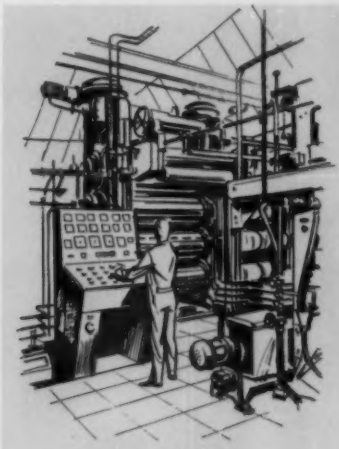
Unplasticised PVC film

Manufactured by the **'LUVITHERM'** process

For the first time, you can obtain from Britain this important type of PVC film. 'Craytherm' has many new and remarkable properties. Of special value are its great strength and resistance to chemical action, which make it suitable for almost unlimited applications. Being non-toxic and odourless it is especially suitable for food packaging.

The NON-TOXIC packaging film for fatty foods

Vacuum formed packs for cooked and uncooked foods. Decorative trays for confectionery and candies. Packs for cosmetics, drugs and baby food.



PLANT IN BRITAIN PRODUCES CRAYTHERM TO THE MOST EXACTING STANDARDS

'Craytherm' is made in two types:

U A normal unstretched film, available in thicknesses from .0012 to .0079 in.

S A film orientated lengthwise to give a higher longitudinal tensile strength. In thicknesses from .001 to .0016 in.

'Craytherm' can be clear, opaque or coloured and embossed, and printed by photogravure, silk screen or letterpress.

'Craytherm' is excellent for vacuum forming.

'CRAYLENE'

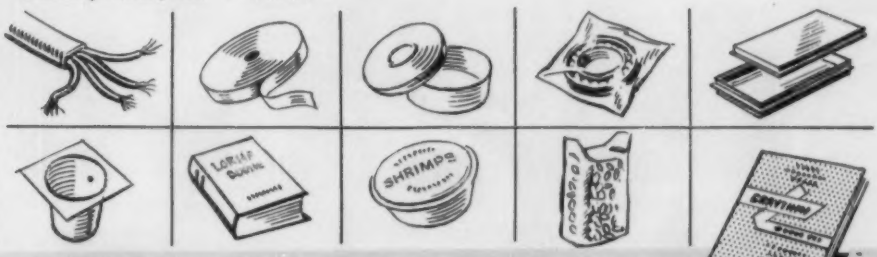
All purpose vinyl packaging film protects goods of all kinds from dust, damp, and atmosphere impurities. Excellent for drum liners and chemical packs. Special formulations for pressure sensitive adhesive tapes and pharmaceutical strappings and dressing, and for specific applications

'CRAYPAK'

Clear, lightweight, PVC packaging film.

A film that combines exceptional strength with thinness and light weight. It has excellent dielectric and chemical properties. Crystal clear or in opaque and translucent colours. In sheeting or lay flat tubing.

Electrical insulation, sound recording tapes, pressure sensitive adhesive tapes. 'Camelback' sheeting for motor tyre trade. Backing strip for surgical tapes. Stationery folders, book and leaflet covers, children's books. Laminated materials. 'Craytherm' can be laminated to paper, metal foils, and other films. Lampshades, plain or embossed, in attractive colours.



** Our Technical Department, will be glad to give you any advice or information about the limitless uses of 'Craytherm', 'Craylene' or 'Craypak' film. They will be pleased to place at your disposal the facilities of our research laboratories for the development of new applications.*

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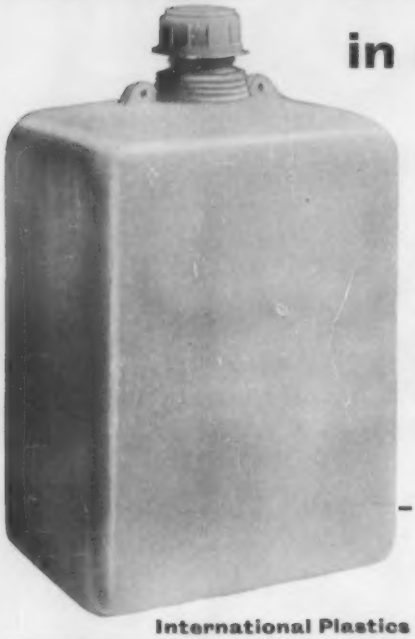
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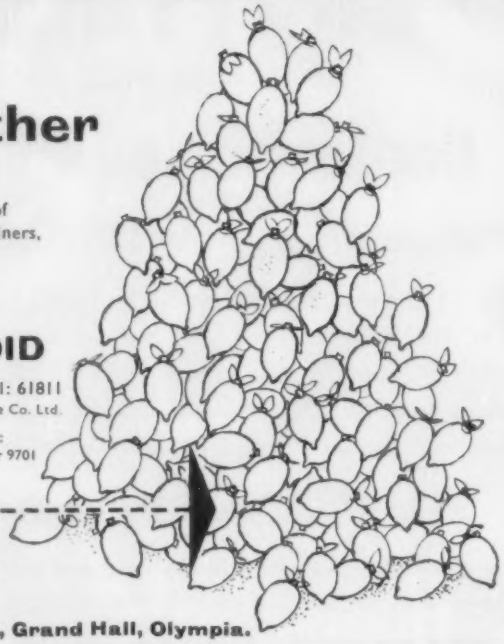
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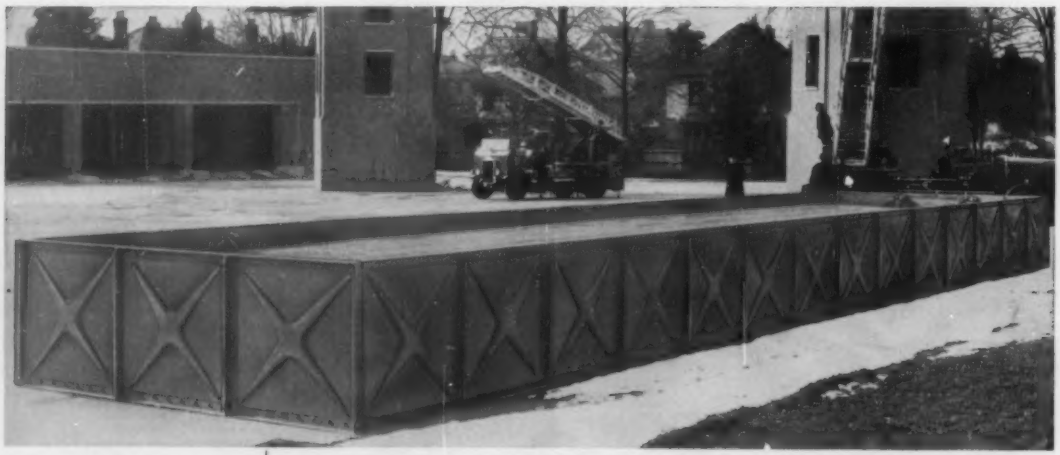
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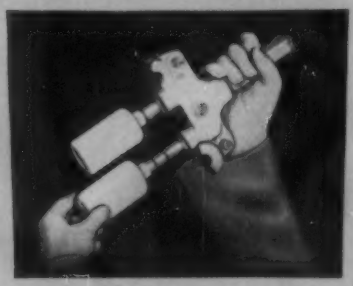
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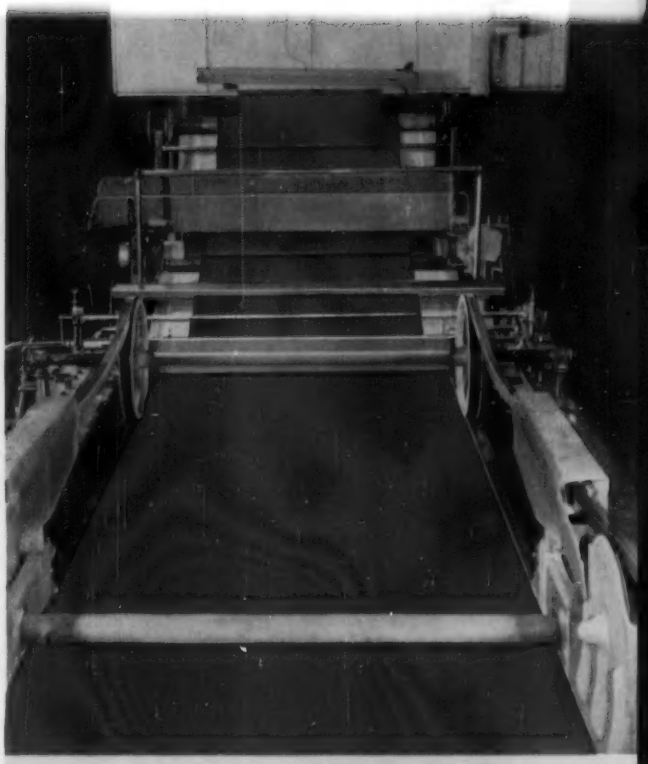
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Plastics Digest

Abstracts from the world's literature of interest to those who make or use plastics or plastic products. For complete articles, send requests direct to publishers. List of addresses is at the end of Plastics Digest.

General

New international standards in electrical insulation. J. F. Dexter. Elec. Mfg. *58,* 147-49, 324 (Oct. 1956). A report detailing the activities and accomplishments of the technical committees and working groups of the International Electrotechnical Commission specifically charged with responsibility for international standards in electrical insulating materials is presented. The 1956 meetings were marked by agreements on new standards, progress in establishing new areas of joint study, and mutual understanding of certain conflicting national viewpoints. The working groups whose activities are discussed are the following: No. 1, Dielectric Strength; No. 2, Volume and Surface Resistivity, Insulation Resistance; No. 3, Tracking; No. 4, Endurance of Insulation to Gaseous Ionization Effects under Long Time Exposure; No. 5, Encyclopedia of Insulation; No. 6, Dielectric Constant and Loss in Insulation Materials; No. 7, Thermal Stability. Other groups considered a number of questions important in the field of insulation testing.

A directory of the Canadian plastics packaging industry. Canadian Plastics *1956,* 52-60, 62-66, 68, 70, 72, 74, 76 (Nov.). A comprehensive directory of the Canadian plastics packaging industry is presented under the general headings of Finished Products, Services, Materials and Supplies, Machinery and Equipment, and Company Addresses.

Materials

New British standards for PVC sheet. Brit. Plastics *29,* 380 (Oct. 1956). Two new British Standards for polyvinyl chloride plastic sheet have been issued. One is a revision, with increased scope, of B. S. 1763, now entitled "Thin polyvinyl chloride sheeting (flexible unsupported)" and the other, B. S. 2739, "Thick polyvinyl chloride sheeting (flexible unsupported)" is new.

Persistent problems in the field of reinforced plastics. B. Parkyn. Brit. Plastics *29,* 452-55 (Dec. 1956). Some of the more important facts that are known about some persistent problems in the field of reinforced plastics are discussed. The problems reviewed are: the high degree of scatter in physical test data on glass-polyester laminates, painting and finishing wet lay-up moldings, determining degree of cure, mass production of glass-polyester moldings, and yellowing of corrugated sheeting.

Introducing a new raw material. Canadian Plastics *1956,* 46, 48 (Sept.). A new raw material, "Emgol 1022" (Emery Industries), which can be used for producing a variety of plastics is described. It is a polymerized fatty acid derived from naturally occurring fats; while being polymerized it is made into a carboxyl compound, similar to maleic or phthalic anhydrides which are the building blocks of polyesters and alkyds. The new material will react with diamines to form long chain polyamide resins useful as moisture barrier coatings, laminating and heat sealing agents. Guanamine derivatives of the material will react with formaldehyde to produce resins that possess the unusual property of setting by oxidation in contact with air. It can be used in urethane formulations to lower cost and to make the foam reaction easier to accomplish. The esters of this new fatty acid make effective plasticizers for various plastics. It has considerable utility also when used in combination with other resins to produce protective coatings with less skin dry and wrinkling tendencies. Other applications for this material include lube oil additives and sizing agents.

High-density polythene. J. S. Gourlay and M. Jones. Brit. Plastics *29,* 446-51 (Dec. 1956); Plastics (London) *21,* 353-57 (Dec. 1956). The new commercial methods for producing high-density polyethylene are discussed. These involve the use of a supported metal oxide catalyst or the use of a metal alkyl catalyst. The relationship between numerous properties and density is shown. As the density rises, there is a tendency toward greater brittleness, and the molecular weight of commercial high-density polyethylenes is therefore raised to eliminate this possible weakness. Differences between techniques for processing low-density and high-density polyethylenes are discussed. Some applications for high-density polyethylene are discussed, including film, cable covering, and pipe.

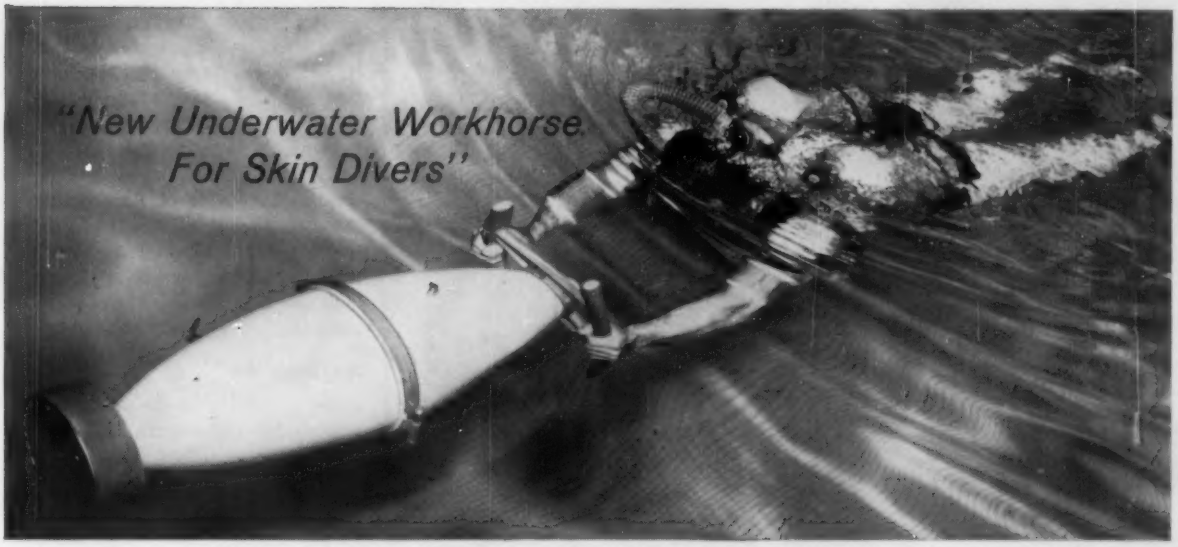
Silane finishes. Chem. Eng. News *35,* 90, 92 (Feb. 25, 1957). Three new silane finishes for glass fibers are described. These finishes increase the strength of reinforced plastics made from phenolic, polyester, epoxy, and melamine resins.

"Zytel" nylon resins. W. C. Warriner and A. J. Cheney. Mechanical Eng. *78,* 1118-20 (Dec. 1956). The properties and uses of nylon molding compounds are reviewed.

Molding and fabricating

Sinter coating equipment. Plastics (London) *21,* 339 (Dec. 1956). A new process for coating complex metal shapes with an even coat of a plastic material is described. The process involves heating the metal part to a temperature of 220 to 250° C. and dipping it into a tank containing finely divided

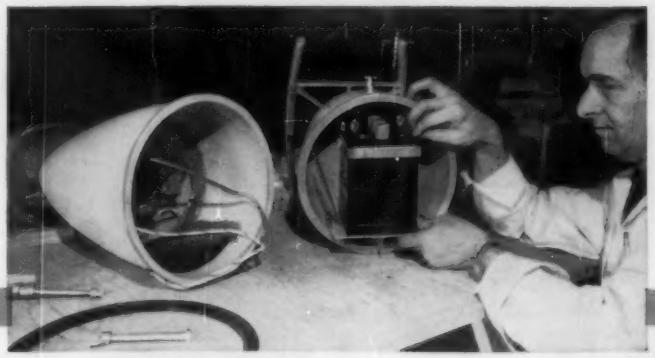
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Applications

Experimental glass-polyester enclosure for motorcycle. R. Wood. Brit. Plastics *29*, 430-33 (Dec. 1956). The designing and fabrication of a fibrous glass-polyester enclosure for a motorcycle are described. The enclosure offers weather protection and improved performance due to streamlining.

Properties

Electron irradiation of polyacrylates. A. R. Shultz and F. A. Bovey. J. Polymer Sci. *22*, 485-94 (Dec. 1956). The crosslinking and degradation of seven polyacrylates by 1000 kvp electrons was investigated. Gel content-radiation dose analysis reveals the energy dissipation per main-chain fracture, E_d, to be about the same (530 $\pm$ 100 electron v.) for methyl, *n*-butyl, *sec*-butyl, and *tert*-butyl acrylate polymers. The energy dissipation per crosslinked unit formation, E_c, is 80-90 e.v. for methyl, *n*-butyl, isobutyl and neopentyl acrylate polymers. E_c may be slightly higher for poly-*sec*-butyl acrylate. Poly-*tert*-butyl acrylate possesses a uniquely high E_c of 300 e.v. The presence of hydrogen atoms alpha to the alcoholic oxygen of the ester group is believed to contribute strongly to the crosslinking reactions of polyacrylates under ionizing radiations. Poly-1,1-dihydroperfluorobutyl acrylate exhibits an initial E_c of $\sim$45 e.v. and an E_d of $\sim$450 e.v. Beyond 15 megareps the ratio of main-chain fracture to crosslink formation increases.

Mechanical properties of plastic laminates. R. L. Youngs. Forest Products Lab. Report No. 1820-C (Nov. 1956). The results of tension, compression, and bending

tests of three different parallel-laminated epoxy laminates reinforced with 143, 112, or 120 glass fabric are reported. The data supplement those of Forest Products Laboratory Reports 1820, 1820-A, and 1820-B of the same title, in which results of tests of a number of polyester laminates and of two epoxy laminates were given. Tension tests were made after normal conditioning; compression and bending tests were made after both normal and wet conditioning. The results are presented both in tables and as average curves. Mechanical properties in tension, compression, and bending, and computed shear-strength values of epoxy laminates tested in this study are generally higher than those for similar polyester laminates previously studied.

Permeation of polychlorotrifluoroethylene films by nitric acid. F. H. Garner, S.R.M. Ellis and J. C. Gill. J. Appl. Chem. *6*, 407-12 (Sept. 1956). The permeation of polychlorotrifluoroethylene films by nitric acid was found to occur at a limited number of sites in the surface of the film. These sites were detected by using paper impregnated with a suitable indicator and also by microscopic examination. They were found to be randomly distributed and were mainly macro- or visible cracks. Counts were made of the number and size distribution of the cracks. Infra-red spectrometry was used to investigate whether chemical reactions occurred between nitric acid and the fluorinated plastic film, but no evidence of chemical degradation products was found.

Effect of moisture sorption on weight and dimensional stability of alkyd-isocyanate foam core. V. C. Setterholm and E. W. Kuenzi. Wright Air Development Center Technical Report 56-86 (Sept. 1956). Tests were made to determine changes in weight and dimensions of alkyd-isocyanate foam cores subjected to immersion in water and exposure to high humidity for sixty days. Cores of varying densities were investigated. The results indicated that there are differences between alkyd-isocyanate foams that have

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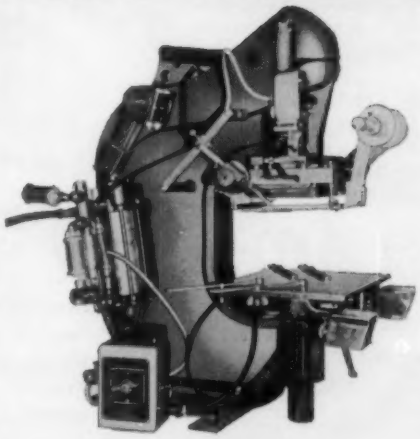
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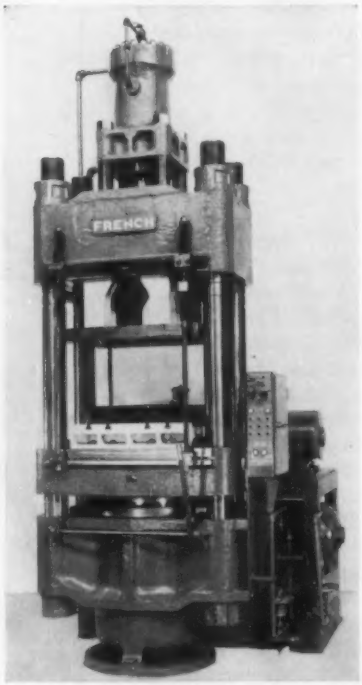
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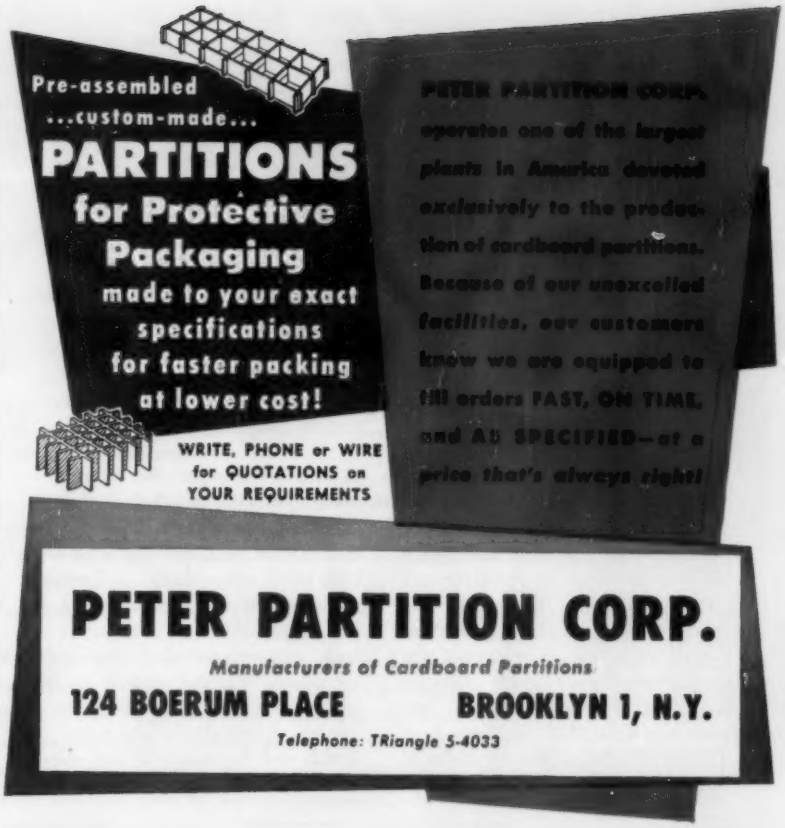
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Compatibilities of the coumarone-indene resins-solvent systems. A. C. Zettlemoyer and J. Vanderryn. Ind. Eng. Chem. 49, 220-25 (Feb. 1957). The solubility relationships of polyindene resins of low molecular weight were determined in organic solvents to aid their use in coating compositions, asphalt tile, and rubber products, and to compare them with high polymers. Different quantitative solubilities are manifested by these low polymers in mineral oil-resin systems. The precipitation temperatures of the unfractionated polymers are controlled by the fraction of highest molecular weight. The critical composition of the resin-solvent systems are much lower than theory predicts. Thermodynamic parameters for solutions of polyindene in amyl and heptyl alcohols are about one-half those for a high molecular weight polystyrene-octyl alcohol system and cannot be explained by existing theory.

Glassy state transitions of poly-(chlorotrifluoroethylene), poly-(vinylidene fluoride), and their copolymers. L. Mandelkern, G. M. Martin, and F. A. Quinn, Jr. J. Research Nat. Bur. Standards 58, 137-43 (Mar. 1957). The glassy transition temperatures of poly-(chlorotrifluoroethylene), poly-(vinylidene fluoride), and copolymers prepared from these two comonomers were determined, using dilatometric and interferometric methods. The glassy temperature of poly-(chlorotrifluoroethylene) was found to be at 45° C., an upper limit for the glassy temperature of poly-(vinylidene fluoride) was set at −35° C., and the glassy temperatures for the copolymers were between the values for the two homopolymers. These results are found to substantiate the recent theoretical





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deductions of Fox and Loshack relating the glassy temperature of a copolymer to its composition, and indicate that the glassy temperature of a copolymer is a monotonic function of its composition. The effect of crystallization of a copolymer on the location of its glassy temperature is illustrated and the various contradictory results of this effect that have been reported are discussed.

Testing

Accelerated fatigue of plastics. L. S. Lazar. A.S.T.M. Bulletin No. *220*, 67-72 (Feb. 1957). In this preliminary investigation of relatively simple polymer systems under various fatigue conditions, the Prot method yields a good approximation of the endurance limit as obtained in conventional fatigue testing. The work has shown that, as well as providing a good short-time estimate of the endurance limit under various conditions (a time saving of approximately 90%), the Prot method eliminates the problem of treating data for samples that continue running beyond some arbitrary number of cycles in an ordinary fatigue test. The method also greatly reduces scatter, which becomes large near the endurance limit in an ordinary fatigue test. Further study of the Prot method of accelerated fatigue testing seems warranted.

Force and weight standards gain new importance in industry. A. C. Ruge. A.S.T.M. Bulletin No. 218, 31-33 (Dec. 1956). New calibration equipment, based on electrical strain gages, for mechanical testing machines is described.

A strain gage for the measurement of strains in adhesive bonds. C. B. Norris, W. L. James, and J. T. Drow. A.S.T.M. Bulletin No. 218, 40-49 (Dec. 1956). A method is described for measurement of tensile strain in a thin adhesive bond between metallic adherends, by measuring the change in the electrical capacitance of the specimen. Accurate evaluations of strain can be made if the effect of changes in glue-line thickness on the dielectric constant can be determined. For some adhesives, this effect may be calculated using the Lorenz-Lorentz equation relating dielectric constant to density, when density is assumed to vary inversely with the thickness of the glue bond.

Colorimetric determination of titanium in polyethylene. R. A. Anduze. Anal. Chem. *29*, 90-91 (Jan. 1957). Titanium can be determined colorimetrically in polyethylene by a method that involves ignition in an oxygen bomb, separation from interfering elements by coprecipitation with zirconium arsenate, and reaction of titanium with hydrogen peroxide in sulfuric acid solutions. The color produced is measured at 410 mμ. Amounts as low as 3 p.p.m. can be determined.

Chemistry

Copolymerization of styrene and acrylonitrile in aqueous dispersion. G. Mino. J. Polymer Sci. *22*, 369-83 (Dec. 1956). The bead copolymerization of styrene-

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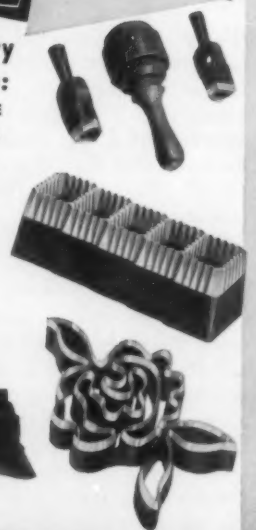


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acrylonitrile, in the presence of 1-azobis-1-phenylethane was investigated at high temperature (90-100° C.). The initial distribution of acrylonitrile between styrene and the aqueous phase and the change of this distribution during the copolymerization were determined. The concentration of acrylonitrile in the aqueous phase remains fairly constant up to 20-25% conversion, then it decreases rapidly up to about 90% conversion. The over-all rate of copolymerization following an induction period, remains constant up to about 30-35% conversion, then it increases slightly only to decrease rapidly at about 90% conversion. In a system of this type the mole fraction of acrylonitrile in the oil phase increases through the polymerization, partly because acrylonitrile reacts at a lower relative rate, partly because the acrylonitrile dissolved in the aqueous phase diffuses continuously into the beads. The reactivities of styrene and acrylonitrile in aqueous dispersion are the same as in bulk if the partition of acrylonitrile between the two phases is taken into account. The initial rates of copolymerization, in bulk, increase with the acrylonitrile content of the mixture. At high conversion, a marked acceleration in rates takes place.

Publishers' addresses

A.S.T.M. Bulletins: American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

Analytical Chemistry: American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.

British Plastics: Iliffe and Sons, Ltd., Dorset House, Stamford St., London S. E. 1, England.

Canadian Plastics: Monetary Times Printing Co., Ltd., 341 Church St., Toronto 2, Ontario, Canada.

Chemical and Engineering News: American Chemical Society, 1155 Sixteenth St., N. W. Washington, D. C.

Electrical Manufacturing: The Gage Publishing Co., 1250 Sixth Ave., New York, N. Y.

Industrial and Engineering Chemistry: American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.

Forest Products Laboratory Reports: Forest Products Laboratory, Dept. of Agriculture, Madison, Wis.

Journal Applied Chemistry: Society of Chemical Industry, 56 Victoria St., London S. W. 1, England.

Journal Polymer Science: Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y.

Journal of Research of the National Bureau of Standards: Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Mechanical Engineering: American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Plastics (London): Temple Press Ltd., Bowling Greene Lane, London E. C. 1, England.

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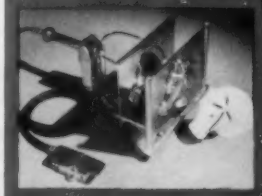


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U.S. Plastics Patents

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Polymers. A. R. Garabrant, H. G. Schneider, H. G. Goering, and H. O. Mottern (to Esso). U. S. 2,779,753, Jan. 29. High molecular polymers of isobutylene.

Resin. M. Erchak, Jr. (to Allied Chemical). U. S. 2,779,754, Jan. 29. Chlorinated ethylene alkanol telomers.

Flow tester. A. E. Noble, C. F. Anness, J. B. Hyman, and R. W. Raetz (to Catalin). U. S. 2,780,096, Feb. 5. Device for testing rheological properties of plastic materials.

Container. G. S. Nalle, Jr. U. S. 2,780,259, Feb. 5. Plastic container with cover.

Polymers. J. T. Clarke and A. H. Hammerschlag (to Ionics). U. S. 2,780,604, Feb. 5. Polychloromethylstyrene.

Plasticizer. J. C. Petropoulos (to American Cyanamid). U. S. 2,780,609, Feb. 5. Plasticized polyvinyl chloride.

Polymer. W. A. Barber and H. Z. Friedlander (to American Cyanamid). U. S. 2,780,610, Feb. 5. Compositions of a polymer of acrylamide and ethylene glycol.

Copolymers. L. C. Rubens (to Dow). U. S. 2,780,613, Feb. 5. Copolymers of monovinylbenzene and polyesters.

Mixtures. M. T. Harvey (to Harvel). U. S. 2,780,614, Feb. 5. Mixtures of a diene rubber and a partially hydrogenated furfuryl-ketone product.

Composition. P. O. Tawney and R. W. Amidon (to U. S. Rubber). U. S. 2,780,615, Feb. 5. Composition of polyvinyl chloride and diolefin-monovinyl pyridine copolymer.

Polymers. J. B. Dickey and H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,780,616, Feb. 5. Polymers of dialkyl 2-cyanopropene-3-phosphonates.

Polymerization. A. Zletz (to Standard Oil). U. S. 2,780,617, Feb. 5. Polymerizing ethylene with conditioned molybdena catalyst.

Extruder. E. C. Bernhardt (to Du Pont). U. S. 2,780,834, Feb. 12. Extruder equipped with a mulling head.

Extrusion. O. B. Sherman. U. S. 2,780,835, Feb. 12. Apparatus for extruding plastic tubes.

Laminate. A. W. Kehe (to Richardson). U. S. 2,781,076, Feb. 12. Arc-resistant phenolic laminate.

Sheet. C. A. Dovidio (to Nixon Nitration). U. S. 2,781,077-8, Feb. 12. Vacuum forming thermoplastic sheet.

Photosensitive material. F. W. von Meister (to Keuffel and Esser). U. S. 2,781,265, Feb. 12. Photosensitive polystyrene compositions.

Benzyl cellulose. W. E. A. Simon (to Brycel). U. S. 2,781,276, Feb. 12. Treating benzyl cellulose to avoid bubble formation during molding.

Sheet. E. L. Grustus and L. L. Yaeger (to Tru-Scale). U. S. 2,781,287, Feb. 12. Glass-fiber-reinforced plastic sheet.

Ion exchange resin. G. J. Martin and M. J. Sullivan (to National Drug). U. S. 2,781,290, Feb. 12. Therapeutic cation exchange resin.

Molding composition. E. Lewis, Jr. (to American Viscose). U. S. 2,781,326, Feb. 12. Granular thermosetting molding composition.

Polyacrylonitrile. J. V. Hewett (to Du Pont). U. S. 2,781,329, Feb. 12. Inhibiting gelation of a solution of polyacrylonitrile.

Polymers. R. V. Jones and P. J. Canterino (to Phillips Petroleum). U. S. 2,781,331, Feb. 12. Thiocyanated hydrogenated diene polymers.

Resins. G. Swann and P. G. A. Evans (to Reichhold Chemicals). U. S. 2,781,332, Feb. 12. Etherified melamine resins.

Polymer compositions. I. H. Updegraff (to American Cyanamid). U. S. 2,781,333, Feb. 12. Polymerizable compositions of polyglycidyl esters of polycarboxylic acids.

Copolymers. L. M. Welch, H. L. Wilson, and L. B. Turner (to Esso). U. S. 2,781,334, Feb. 12. Divinyl aromatic modified isoolefin-multiolefin copolymers.

Copolymer. M. E. Cupery (to Du Pont). U. S. 2,781,335, Feb. 12. Aqueous acetic acid soluble polyamines of epoxide copolymers.

Molding. T. L. Hallenbeck and L. D. Ninneman (to Baker Bros.). U. S. 2,781,546, Feb. 19. Machine for plastic molding.

Molding. J. R. Milne. U. S. 2,781,549, Feb. 19. Molding articles having spaced discontinuities.

Polytetrafluoroethylene. R. M. Gray (to U. S. Ceramic Tile). U. S. 2,781,552, Feb. 19. Thin polytetrafluoroethylene articles.

Spray molding. A. A. Varela and H. T. Bangs (to American Cyanamid). U. S. 2,781,553, Feb. 19. Spray molding of aminotriazine resins.

Tubing. R. E. Cornwell (to American Viscose). U. S. 2,781,589, Feb. 19. Processing plastic tubing.

Cellulosic sheet. E. E. Walker, W. R. Foggon, R. S. Locke, and M. P. Shaw (to British Celanese). U. S. 2,782,127, Feb. 19. Plasticized cellulose derivative sheet.

Cellulose acetate. W. D. Paist and F. Berardinelli (to Celanese). U. S. 2,782,128, Feb. 19. Plasticized cellulose acetate.

Polyester. W. L. Bruce (to Goodyear). U. S. 2,782,172, Feb. 19. White factice-isocyanate modified polyester composition.

Polyvinyl acetate. J. E. Bristol, E. P. Czerwin, and N. Turnbull (to Du Pont). U. S. 2,782,173, Feb. 19. Polyvinyl acetate beads and emulsions.

Polymers. A. C. Hetherington and W. O. Teeters (to M. W. Kellogg). U. S. 2,782,174, Feb. 19. Dispersions of perfluorocarbon polymers.

Coatings. P. F. Bruins and S. S. Dorn (to Carboline). U. S. 2,782,175, Feb. 19. Furfural-modified hydrolyzed vinyl acetate-vinyl chloride copolymers.

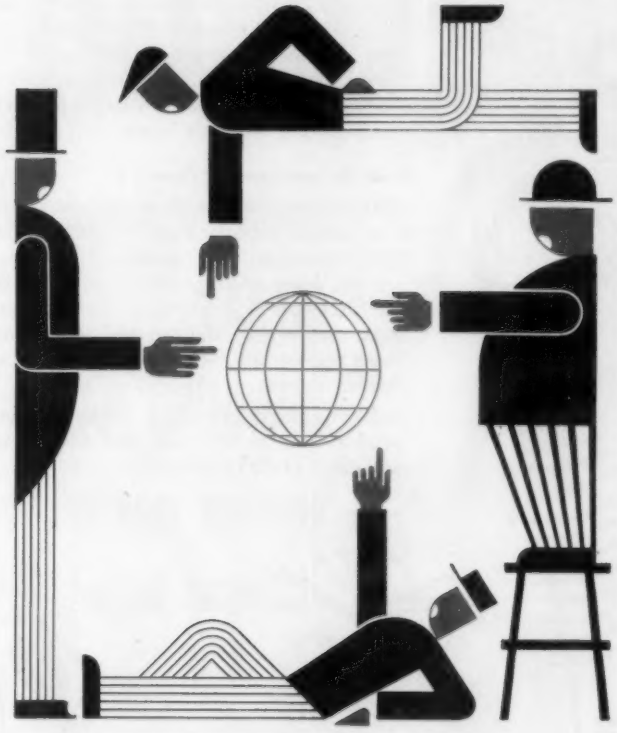
Resins. J. R. Darby and L. D. Frederickson, Jr. (to Monsanto). U. S. 2,782,176, Feb. 19. Vinylidene halide resins stabilized with zinc and calcium salts of phenyl carboxylic acids.

Plasticizers. W. F. Fischer and J. G. Bartlett (to Esso). U. S. 2,782,177, Feb. 19. Acetal plasticizers for polyolefins.

Binders. H. W. Duffee and M. C.

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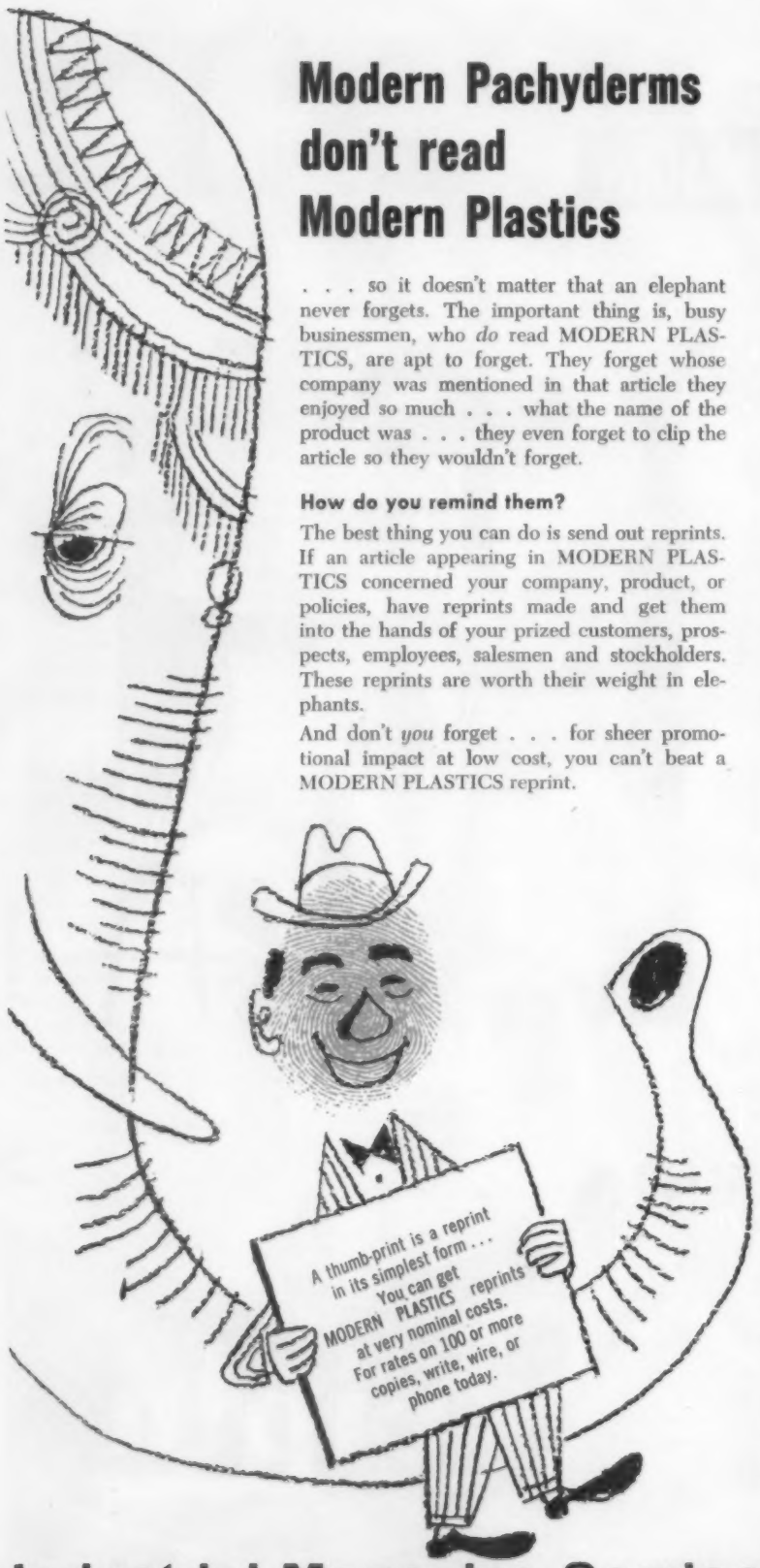
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Armstrong (to Owens-Corning). U. S. 2,782,178, Feb. 19. Amide-formaldehyde binders for glass fibers.

Compositions. J. F. Lontz (to Du Pont). U. S. 2,782,179-80, Feb. 19. Polytetrafluoroethylene-asbestos compositions.

Polymerization. R. M. Verburg (to General Aniline). U. S. 2,782,182, Feb. 19. Interpolymerization of maleic anhydride with vinyl alkyl ethers.

Polymer salts. R. N. Gonzalez (to Monsanto). U. S. 2,782,183, Feb. 19. Polymer separation method for calcium polyacrylates.

Polymers. D. R. Husted and A. H. Ahlbrecht (to Minnesota Mining). U. S. 2,782,184, Feb. 19. Polymers of N,N-bis(1,1-dihydroperfluoroalkyl) acylamides.

Panels. D. C. Emmert and K. E. Vail. U. S. 2,782,458, Feb. 26. Flat fibrous glass reinforced plastic panels.

Molding. R. A. Esslinger (to U. S. Rubber). U. S. 2,782,461, Feb. 26. Molding plastic conveyor belts.

Pipe joint. R. P. Stambaugh and W. H. Watts (to Carbide & Carbon). U. S. 2,782,806, Feb. 26. Plastic-reinforced carbonaceous pipe joint.

Tubing. B. M. Walker and A. N. St. John (to Resistoflex). U. S. 2,783,173, Feb. 26. Laminated pipe made with glass fabric and fluorocarbon resin.

Tubes. J. F. Stephens (to Minnesota Mining). U. S. 2,783,174, Feb. 26. Fibrous reinforced tubes.

Laminating. J. H. Boicey (to Libbey-Owens-Ford). U. S. 2,783,176, Feb. 26. Laminating plastic materials.

Copolymers. H. Schnell (to Bayer). U. S. 2,783,212, Feb. 26. Cross-linked copolymers of an acrylic acid as cation exchange resins.

Resin composition. E. C. M. Homan (to Cordo Chemical). U. S. 2,783,214, Feb. 26. Mixing a self-curing resin mass.

Polyesters. P. Robitschek and C. T. Bean, Jr. (to Hooker). U. S. 2,783,215, Feb. 26. Flame-retardant halogenated polyesters.

Resins. R. W. Martin (to Shell). U. S. 2,783,216, Feb. 26. Resins from Mannich bases of aromatic polyketones.

Copolymers. F. J. Honn and W. M. Sims (to M. W. Kellogg). U. S. 2,783,217, Feb. 26. Copolymers of a

perfluorochloroethylene and a hydrocarbon diene.

Polyvinyl alcohol. W. L. Kuechler (to Du Pont). U. S. 2,783,218, Feb. 26. Hydrolyzing a shaped polyvinyl acetate mass.

Fluorine polymers. H. J. Passino, A. L. Dittman, and J. M. Wrightson. U. S. 2,783,219, Feb. 26. Trifluorochloroethylene polymer.

Polymers. G. B. Payne and C. W. Smith (to Shell). U. S. 2,783,250, Feb. 26. Polymers of unsaturated esters of epoxy-substituted polycarboxylic acids.

Extrusion machine. A. B. F. R. Gillespie (to British Insulated Callender's Cables). U. S. 2,783,498, Mar. 5. Screw extrusion machine.

Molding. T. R. L. Lazarr (to Western Electric). U. S. 2,783,500, Mar. 5. Apparatus for molding plastic sheet.

Hollow articles. O. B. Sherman (to Owens-Illinois). U. S. 2,783,503, Mar. 5. Forming hollow plastic articles.

Metering. C. W. Vogt. U. S. 2,783,922, Mar. 5. Drive system for plastic metering.

Adhesive. A. E. Davis (to Nashua). U. S. 2,784,111, Mar. 5. Double phase adhesive films.

Adhesive. F. B. Joyner and H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,784,127, Mar. 5. Plasticized monomeric adhesives.

Laminate. J. P. Schroeder (to Carbide and Carbon). U. S. 2,784,128, Mar. 5. Styrene-acrylic acid polymer composition.

Polyacrylonitrile. W. M. Wooding and N. T. Woodberry (to American Cyanamid). U. S. 2,784,135, Mar. 5. Polyacrylonitrile films and laminates.

Polyacrylonitrile. R. J. Slocombe (to Monsanto). U. S. 2,784,169, Mar. 5. Polyacrylonitrile stabilized with vinyl phosphonates.

Heat stabilizers. A. T. Walter and D. M. Young (to Carbide and Carbon). U. S. 2,784,170, Mar. 5. Polychlorotrifluoroethylene stabilized with metal nitrites.

Light stabilizers. D. H. Chadwick (to Monsanto). U. S. 2,784,171, Mar. 5. Halogen-containing resins stabilized with cadmium alkyl vinyl phosphonates.

Polyacrylonitrile. R. J. Slocombe and G. L. Wesp (to Monsanto). U. S. 2,784,172, Mar. 5. Polyacrylonitriles stabilized with acrylic acid salts.

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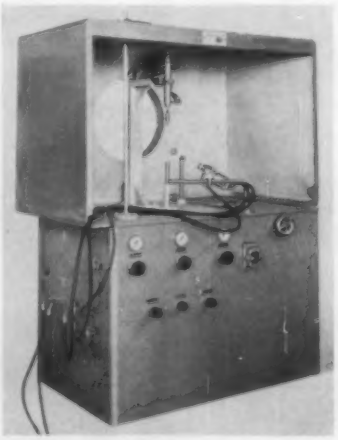
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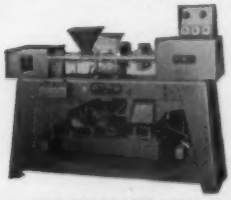


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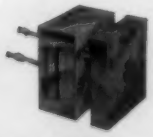
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WRITE FOR complete data on model H-250 and other equipment shown.

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PLASTIC GRINDER Grinds up rejects, waste, etc., for re-use.



MOLD BASES Available from stock.

THE VAN DORN IRON WORKS CO., 2685 EAST 79th ST. • CLEVELAND 4, OHIO



National Automatic injection molding machine, incorporating a closed-circuit hydraulic system and reversing Oilgear pump

Specifications for two Natco injection machines

Characteristics	*Model 400*		*Model 800*	
Capacity				
G-P Polystyrene injected per shot (without packing), oz. at 20,000 p.s.i.	20 to 29		60 to 87	
Plasticating capacity (general purpose polystyrene), lb./hr.	165		270	
Injection				
Injection pressure (at plunger to material interface), p.s.i.	20,000	(30,000)*	20,000	(30,000)
Injection plunger diameter, in.	3½	(2⅞)	5	(4⅛)
Injection plunger stroke, in.	15	(15)	21	(21)
Rate of injection, cu. in./sec.	19	(13)	33	(22)
Injection plunger speeds, in./min.				
Inject (at maximum pressure)	119		102	
Return	295		260	
Time of injection (using maximum shot and pressure), sec.	3.5		6.1	
Hydraulic line pressure (maximum), p.s.i	2000		1955	
Clamping				
Mold clamping pressure (live hydraulic), max., tons	425		850	
Mold clamping stroke, in.	26		40	
Daylight opening (with ejector box installed), max., in.	38		55	
Daylight opening (with ejector box removed), max., in.	50		70	
Clearance between tie rods, in.	25 by 25		36½ by 36½	
Mold size, max., in.	38 by 24¾		55 by 36¼	
Mold closing speed (fast), in./min.	700		630	
Ejecting force, tons	21		44	
Ejector stroke, in.	5¼		6	
Hydraulic line pressure (maximum), p.s.i	2070		2115	
General				
Motor (3 ph. 60 cy. 220/440 v.), hp. by r.p.m.	40 by 1200		75 by 1200	
Motor (3 ph. 60 cy. 220/440 v.), hp. by r.p.m.	7½ by 1800		11½ by 1800	
Electric heater 220 v. only, k.w.	24		30	
Over-all dimensions (width by length by height), in.	67 by 254 by 110		86 by 340 by 126	

*Numbers in parentheses apply when smaller, high-pressure ram is in use.

equipment and are protected by devices that prevent the mold from closing if it is not clear. The vertical models can be supplied with an attachment that saves time when inserts must be loaded. Sold and serviced in the U.S. by *Molding Systems, Inc., Danielson, Conn.*

Injection molding machines

A new maker enters the injection machine field with a line of machines in the middle-capacity range. Specifications for Models 400 and 800 are listed below. These machines feature a closed-circuit hydraulic system and a reversing Oilgear pump (see "A molder's molding machine," p. 152, for a description of this new system) that eliminates hydraulic shock. They are equipped with a metering-type vibratory feeder, but will be furnished with Exact Weight scales if desired. Plug-in-type control instruments are grouped at eye level close to the operator's normal position.

The elements of the hydraulic system are mounted *above* the clamping cylinder, out of the way of dirt and easily accessible—there is nothing at all inside the base. Pyrometers control the cylinder heaters and a variac is provided for the nozzle heater. Heaters are wired in such a way that current is always on: in the usual "off" position the voltage is cut from 220 to 110, rather than completely off. This gives closer control of temperature and prolongs heater life. A special panel of lights behind the heaters (see photo) shows the voltage of the moment and instantly reports open circuits. Almost the entire electrical system is behind a single panel that can quickly be removed. An optional extra feed bushing and plunger makes it possible to reach injection pressures up to 30,000 p.s.i. Prepacking is possible with either size plunger. *National Automatic Tool Co., Richmond, Ind.*

Ignition-point tester

The Setchkin apparatus tests the ignition points of solids, including plastics. It is essentially a ceramic chamber into which the specimen is placed. The chamber can be heated evenly from the outside



Molded PLEXIGLAS lighting shield

Plexiglas...hardworking and handsome



Molded PLEXIGLAS control panel

Strong, weather-resistant shields for outdoor lighting . . . colorful, gleaming control panels and decorative parts that add to the sales appeal of household appliances . . . these are typical of the widely varied applications for which PLEXIGLAS® molding powder is being used today.

This acrylic plastic has both brawn and beauty. Notable resistance to impact, weather and discoloration . . . brilliant colors or crystal clarity . . . the ability to be molded in large sections and complex shapes—these advantages can be put to work for *you*. Our design staff will be glad to consult with you.

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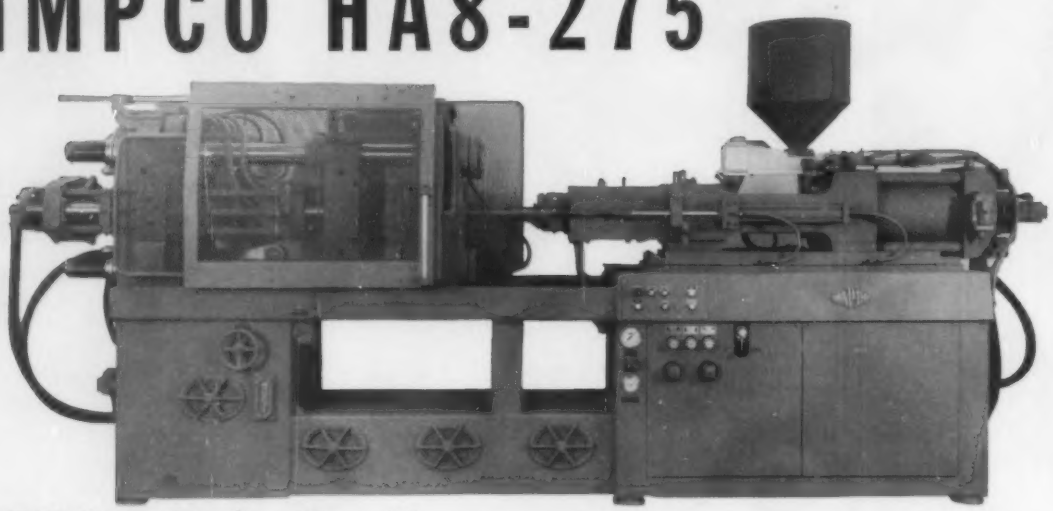
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Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay East, Toronto, Ontario, Canada*

IMPCO HA8-275



750 Dry Cycles Per Hour at Full 14¼" Stroke with this 8-10 ounce machine

Send today for Bulletin P-114.

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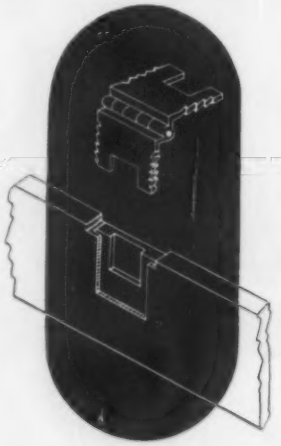
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(Holds like
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with
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double action
"C" Springs



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MOLD COST FOR THIS PART?



Actual Size

Nothing!

Performance:
SUPERIOR

Price:
CHEAPER

SAVINGS effected by converting from bronze to Nylon paid for the mold of this spherical bushing.

Formerly it was a 5-step machining operation at a unit cost of .575 cents. It is now made in one operation. In 1000 lots each part costs .255 cents. *Savings on the initial order paid for the mold.*

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DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS, 7K, MINNESOTA

by a Nichrome coil which in turn is surrounded by 2.5-in. asbestos wool insulation. Appropriate thermocouples provide means of heating-rate control and, of course, report the temperature at which ignition occurs. The method has been published by the National Bureau of Standards and is under consideration by the ASTM. *Custom Scientific Instruments, Inc., Kearny, N. J.*

Paintable mold release

Many silicone mold releases leave the surface of the molded item unreceptive to paints and inks. "Slide" paintable silicone mold release does not. Molders may paint, plate, or hot-stamp directly on a molding that has come from a mold on which Slide was sprayed. It is heat-stable, nonvolatile, resists oxidation. Packed in 20-oz. aerosol containers. *Perc E. Harms Co., Wilmette, Ill.*

Rotational molding equipment

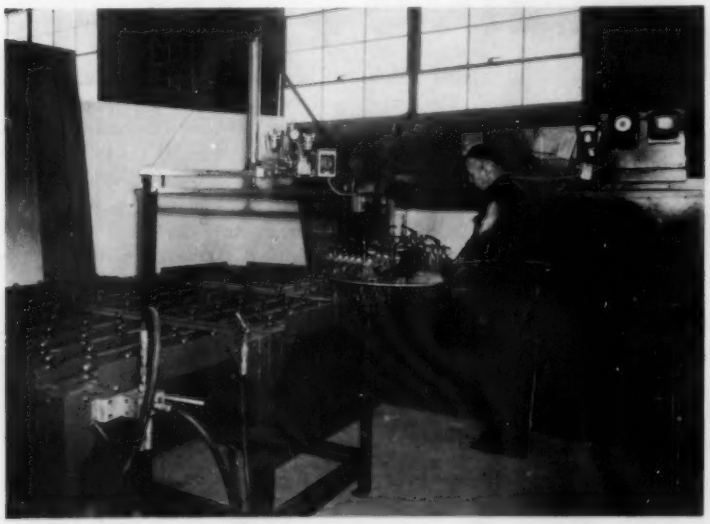
This line includes a double rotational casting machine, an automatic cooling unit, transfer tables, and vinyl plastisol pumping and filling equipment. The casting machine, the newest of these, consists of a forced-hot-air oven with two rotatable shafts on which mold-holding equipment can be spun, with appropriate controls for indexing and temperature. Over-all dimensions are 78 in. high by 85 in. wide by 70 in. deep. The rolling door, which opens one half the oven at a time, is 20 in. high by 36 in. wide. Heating is accomplished with a gas burner (200,000 B.t.u./hr.), but may be electric if desired. The ½-hp. heat-type blower, delivering 1500 c.f.m., is integral with the inside combustion chamber but has its shaft and bearings mounted externally. Rotator drive is variable in speed, electrically braked. *E. B. Blue Co., Connecticut Ave., S. Norwalk, Conn.*

Threaded inserts

Through-threaded aluminum inserts are now available from a new maker. Offered in plain, brass-plated, and anodized aluminum, Type B inserts have holes tapped with Class II threads to conform to ASME specs in sizes from 4/40 to 0.25/28. The threaded holes are reamed *after* tapping to facilitate slipping inserts over locating pins in the mold. Their outside surfaces are coarsely knurled. *Yardley Precision Products Co., 20 Afton Ave., Yardley, Pa.*

Low-cost polyurethane foamers

The Model 800 foam machine has a laterally traversing mixing head and a power-driven mold conveyor. The machine is said to successfully blend or foam all formulations manufactured to date. All parts are made of corrosion-resisting materials. Capacity is up to 8 lb./min., de-



E. B. Blue rotational molding equipment in operation

MM

MARKED IMPROVEMENTS in

IDENTIFICATION AND DECORATION



Fifteen thousand kinds of "ink"? . . .

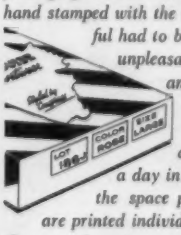
Since 1911, Markem has developed more than 15,000 different marking compounds, and about 10,000 are currently in use. Why so many? Consider the applications: what will "stick" on polystyrene won't on cellulose acetate; what makes clear, lasting imprints on glass drug ampules is a distant chemical relative of the right marking compound for pressure-sensitive tape; and so it goes, from shoe linings to instrument dials, lipstick tubes to lollipop sticks. With all the possible combinations of drying speed, opacity, toxicity . . . liquid, paste and semi-paste forms . . . air dry, baking or high temperature . . . colors by the score —15,000 doesn't seem so fantastic. But it shows Markem's close attention to the "what"—as well as the "how"—of good marking.

Customer's name in lights . . .



A "special" version of our 20A cylindrical object marker has recently gone to work at a leading electrical plant, imprinting miniature tubular lamps with trademark, wattage, etc. Noteworthy are the feed and marking speed of these rather fragile items: up to 750 (from 4" to 7" long) are put into a hopper, then imprinted at a rate of about 2000 per hour; discharged down a chute to a firing chamber, where imprint is "baked" on. Here again, the right method provides clear marking at production rates.

Don't keep the inspectors waiting . . . is a cardinal rule on any production line, especially at Congress Sportswear where the final inspectors also do the packaging. But boxes were being laboriously hand stamped with the result that a whole roomful had to be kept on hand—a costly, unpleasant situation from every angle. Now with a Markem 45A box marker, imprints are made twice as fast and look far better; $5.00 a day in labor alone is saved, and the space problem is solved. Orders are printed individually, as they are needed. Goes to show how good marking can help all along the line, from production to point of sale.



Providing better ways to decorate or identify products, parts and packages is Markem's entire business. Write Markem Machine Co., Keene 20, N.H., when you need help.

MARKEM

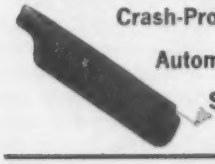
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pending on formulation. The mixing head (all stainless steel) is removable for use with a portable foam-in-place attachment and has its own separate variable-speed drive. Tank heaters are supplied at extra cost if needed to reduce viscosity. Pump motors and switches are explosionproof. Mix ratios can be varied from 1:1 to 25:1. Very similar to the 800, the Model 1500 has up to 15 lb./min. capacity. *Gabriel Williams Co., 77 Mill Rd., Freeport, L.I., N.Y.*

Redesigned bench press

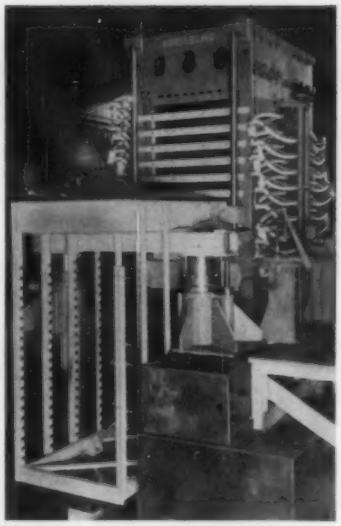
The Model PW, 20-ton press has a bigger platen, greater rigidity, and more precise controls than did its predecessor the Model P. Platen is 12.5 by 9.5 in., has cast-in cooling coils and 1500-w. Calrod heaters in each platen with temperatures to 600° F. controlled by individual Fenwal thermoswitches and relays. Stroke is 4.5 in., ram diameter is 4 in., daylight opening is 4.5 in., with quickly removable adapter giving an extra 4 inches. Two-stage pump is hand operated. Three-platen models are available, and platens can be obtained for use with steam or with no heating or cooling. *Pasadena Hydraulics, Inc., 1433 Lidcombe, El Monte, Calif.*

Versatile foam cutter

A "convolution" machine will make convoluted or irregularly shaped cuts of polyurethane and polyvinyl foam, handling slabs or rolls. It will level the material and split it into sheets as thin as ⅛ in., starting with stock as thick as 15 inches. Slabs up to 9 ft. long (longer with added idler rolls) can be handled. The cutting bed consists of power-driven, strip-type conveyor belts. The cutting blade sharpens automatically at intervals. *Falls Engineering and Machine Co., Cuyahoga Falls, Ohio.*

2200-ton laminating press

This water-hydraulic press has a platen area of 80 by 38 in. and 10 between-platen openings. The standard model operates off the customer's existing accumulator system, at 2500 p.s.i. (max.) but a self-contained oil-hydraulic system will be furnished if desired. The sideplate construction in-



Birdsboro laminating press. Use of elevator is made possible by fact that platens return to given position when press opens

sures great rigidity and minimizes platen deflections. The 11 hot plates are cored for steam, the cooling plates for water. Daylight of each opening is 3.5 in., and when the press opens each platen returns to a given position. This permits using a specially adapted elevator (see cut) with the press that greatly reduces unloading and loading time. Maximum daylight is 77.8 in., stroke is 36 in., and each of the two rams is 34 in. in diameter. *Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa.*

High-speed tensile and compression tester

The Alinco Model 625 tester provides a calibrated stress-strain record of the deformation of a specimen at rates up to 6000 in./min., well into the "impact" range. It can be operated by unskilled personnel. The specimen is clamped in the tension or compression jaws and a "calibrate" button is pressed, resulting in a series of dots being made on the test record. The dots represent increments of stress in the vertical direction, strain in the horizontal. Pressing the "operate" button causes the specimen to be distorted at a constant, pre-selected rate and a stress-strain graph is photographically recorded, along



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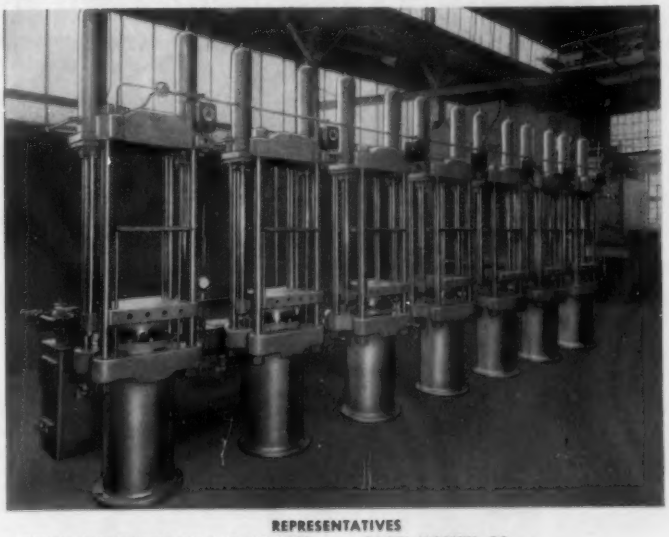
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This system represents considerable reduction in initial and maintenance costs by eliminating the expensive, space-consuming accumulator while retaining its desirable features.

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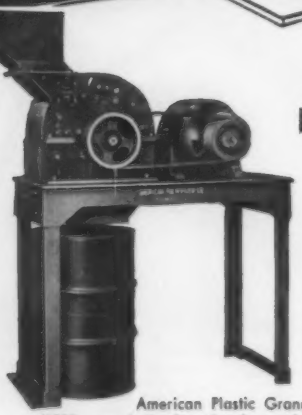
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IN USE EVERY DAY . . . 6 DAYS A WEEK!

In the past year, this American KC-9 Rotary Knife Plastic Granulator, installed at a large St. Louis plastic molding company, has regranulated over 200,000 pounds of plastic scrap to a homogenous granulation . . . at a rate of up to 1500 lbs. per day. (Short scrap is being run through at an average of 300 lbs. per hour.)

American Plastic Granulators—available in two sizes, KC9 and KC12—are built for the heavy-duty demands of constant, tough usage. Size, shape, or kind of plastic is no problem for this sturdy machine. The clean, shearing action of the adjustable rotary cutter blades of fine tool steel, provide fast, once-through regranulation.

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Originators and Manufacturers of Ring Crushers and Pulverizers

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with a series of dots giving the time scale. *Allegany Instrument Co., 1091 Wills Mountain, Cumberland, Md.*

Flexible heating tapes

Heating tapes made of stranded resistance wire protected by braided glass have been known for some years. They are porous, fragile, and can be shorted by moisture outdoors. A maker of such tapes is now producing similar tapes embedded in silicone rubber. Even the lead wires are covered with glass-reinforced silicone. The embedded tapes are resistant to solvents, strong and resistant to abrasion, and cannot be shorted out by moisture. Continuous-duty temperature limit is, however, only 450° F. as compared with 900° F. for the plain glass tape. Temperature limit for intermittent use can be as high as 600° F. Available in 1-in. widths in any length, the new tapes will soon be available in 2- and 4-in. widths. *Briscoe Mfg. Co., 1055 Gibbard Ave., Columbus 3, Ohio.*

Controlled-tension winder

The H-G winder is especially adapted to the winding of polyethylene, vinyl, cellophane, and other films whose proper wind-up is sensitive to variations in web tension. The H-G is readily incorporated into existing production lines. A tachometer generator is driven from the present unwind shaft; the signal controls the H-G winder, so that once tension is set, it is automatically maintained. Tension range is infinitely variable up to 100 lb. at a speed of 600 ft./min. on a 3-in. core. At lower speeds, higher tensions can be used. *Hobbs Mfg. Co., 26 Salisbury St., Worcester, Mass.*

Portable ¾-oz. injection molding machine

The Asmidar APM 21 is a hand-operated injection machine that is capable of molding all thermoplastics and is well suited to making small numbers of test shots. The electrical heaters are regulated by a built-in controller and a thermometer gives the temperature of the alloy-steel cylinder. A quick-acting, cam-lock vise holds molds of various sizes;

Rigid plastic sheeting

for every purpose

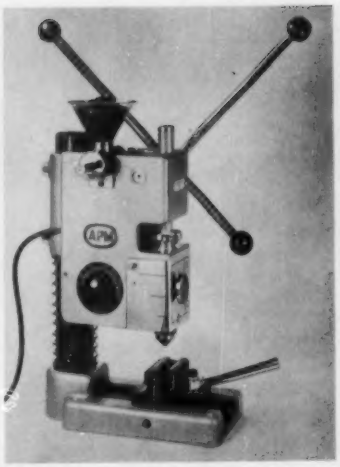


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Scranton Plastic Laminating Corp.

3218 PITTSTON AVE., SCRANTON 6, PA.



British Machine and Foundry ¾-oz. portable injection molding machine

top injection pressure is 5700 p.s.i. Frame and base are hard-enameled cast aluminum. Over-all dimensions are 18 in. high, 8 in. wide, 12 in. deep; weight is 39 pounds. *British Machine and Foundry Supplies, Ltd., 80 Shore Rd., Port Washington, N. Y.*

Combination bender-laminator

A machine that combines the forming and laminating operations in making counter-top bends is rugged but simple in construction. It is claimed to be able to make a finished laminated bullnose in 2.6 min. (including spreading and curing time). The built-in heater consists of two rod-type elements totaling 15 ft. in length. Sheet up to 12 ft. long can be handled in any width. *Trinity Industries, 2910 Bay Rd., Redwood City, Calif.*

Slitter cuts sheeting in roll, eliminates rewinding

A semi-automatic tape cutter makes individual width cuts from vinyl, cellophane, cloth, etc., in the roll. No unwind, rewind steps are necessary. It can handle material up to 37 in. wide, 2.5 in. thick, on paper cores ranging up to 3.5 in. in diameter. A variety of speeds makes it possible to cut each material at its best rate. A manually controlled, but otherwise similar, model is also available. *Black Rock Mfg. Co., Hancock and Osborne Sts., Bridgeport, Conn.*

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Organic Synthesis

By Vartkes Migrdichian
Published in 1957 by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 1822 pages (in two vols.) Price: $35.

The author's purpose was to prepare a comprehensive work dealing adequately with the entire subject of organic synthesis. He aimed for completeness with due attention to the newer developments. With these somewhat conflicting goals, the author has packed a tremendous amount of meat into his two volumes. Loaded with literature references (more than half pre-1910 and only a few dated later than 1952), this work should be a valuable work saver to organic synthesists. Volume I deals with open-chain saturated compounds, Volume II covers the rest. An 87-page subject index seems very complete.

"Technical Data on Plastics"

Published in 1957 by Manufacturing Chemists' Association, Inc., 1625 Eye St., N. W., Washington 6, D.C. 224 pages. Price: $3.25

This newly revised 5th edition describes and catalogs properties of all commercially available plastics, and gives graphical and tabular data on fabrication, durability, electrical, mechanical, and miscellaneous properties of 25 types of plastics materials.

Purpose of the book, according of Gen. J. E. Hull (Ret.), president of MCA, is to help "focus the attention of designers, engineers, molders, and fabricators of plastics on the measured properties of these materials, and on the variables which affect them" thereby making a contribution "towards developing the experience necessary for accurate use of technical data in engineering design." In this connection, also, there is a chapter by Prof. A. G. H. Dietz of the Massachusetts Institute of Technology entitled, "Designing Plastics for Strength."

"Aide-Memoire Dunod Chimie"

By J. Jousset
Published in 1957 by Dunod, 92 rue Bonaparte, Paris (6 eme), France. 3 vol. 864 pages. Price: 430 F. each (ca. $1.40).

This 66th edition, published in three volumes, is the French counterpart, in a somewhat less exhaustive way, of Lange's "Handbook of Chemistry." The volumes deal, respectively, with physical constants found in chemistry, properties and characteristics of organic compounds, and analyses in inorganic and organic chemistry.

Polyethylene injection molding. Technical Service Bulletin No. 2-57, "A Check List for Trouble Shooting Polyethylene Injection Molding Problems," outlines the causes of burning and scorching, discoloration, distortion, flashing, surface blemishes and lamination, short shots, sinks or shrinkage, sticking, poor surface gloss, voids or vacuum bubbles, waviness and flow marks, and weak welds. Remedies for each condition are completely outlined. 12 pages. *Chemical Div., Koppers Co., Inc., 1450 Koppers Bldg., Pittsburgh 19, Pa.*

Adhesives. Reprint of technical paper, "Use of Adhesives with Reinforced Plastics," originally presented before the Reinforced Plastics Div. of the S.P.I., contains data on effect of temperature on tensile shear strengths, physical properties of foamed-in-place plastic sandwiches, peel strength of Kel-F laminate-to-steel bonds with epoxy room temperature curing adhesives, and bond properties of printed circuit laminates made with various adhesives. 8 pages. *Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J.*

Epoxy resin encapsulation. Technical Bulletin No. 18 describes the physical and electrical properties of the Sonite series of filled epoxy resins for room temperature encapsulation of electronic and electrical components. 4 pages. *Smooth-On Mfg. Co., 572 Communipaw Ave., Jersey City 4, N. J.*

Laminates for architects. Manual written and designed by architects for the architectural profession deals with Micarta, a dense laminate protected by a melamine skin. Included are general information, technical data, information on applications and a color and pattern chart. 22 pages. *United States Plywood Corp., 55 W. 44th St., New York 36, N. Y.*

Static eliminator. Bulletin L/A 2778 discusses the design and operation of the Ionotron, a radioisotope-activated static eliminator, and gives suggested applications. 2 pages. *United States Radium Corp., Morristown, N. J.*

Phenolic molding compound. Durez 13124 Black, a two-step, flock-filled, extra strength medium-impact material in modular form, is discussed in a new pamphlet which lists complete physical properties: specific gravity, flexural and tensile strength, shrinkage, water absorption, etc. 4 pages. *Durez Plastics Div., Hooker Electrochemical Co., N. Tonawanda, N. Y.*

Dehydrating agent. Bulletin explains the various uses for Adsorbite D-8, a combination dehydrating and deodorizing agent. *Barnebey-Cheney Co., Columbus, Ohio.*

Thermoplastic extrusion. Product Information Bulletin No. 1029, "Fundamentals of Thermoplastic Extrusion," deals with the extruder, the screw, the die, and post-extrusion equipment. Also treated separately are the theory of melt extrusion, the isothermal

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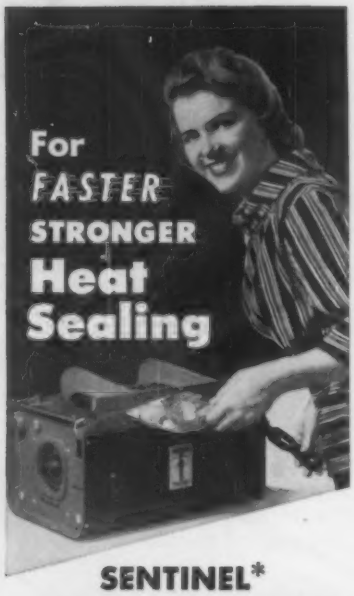
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theory, the adiabatic theory, screw and die characteristic curves, and major factors affecting screw characteristics. A two-page bibliography is included. 32 pages. *Monsanto Chemical Co., Springfield, Mass.*

Silicone emulsions. Bulletin No. 11-35-1-10-56 covers the HSC silicone emulsions, giving their properties, dilution recommendations, uses, stabilities, toxicities, and compatabilities. 2 pages. *Harwick Standard Chemical Co., 60 S. Seiberling St., Akron 5, Ohio.*

Grinding and mixing equipment. Bulletin No. 280 gives detailed information on complete line of grinding and mixing equipment, and provides a special chapter on principles of jar, ball, and pebble mixing. 24 pages. *Process Equipment Div., The U. S. Stoneware Co., Akron 9, Ohio.*

Low pressure polyethylene. Technical Bulletin C-6-216, newly revised, gives the most recent data available on processing and fabrication of Super Dylan low pressure polyethylene. Resistance to solvents and solutions of chemicals, typical physical properties, and specifications are enumerated. *Chemical Div., Koppers Co., Inc., 1450 Koppers Bldg., Pittsburgh 19, Pa.*

Computer. The Graham Computer may be applied not only for ordinary slide rule computations, but also for the rapid solution of any formula, special to a business, involving two variables, raised to any power or root, and a constant. Thirty-two-page booklet, "Fascination in Numbers," explains the computer and contains some very interesting material on mathematics in general. *Graham Transmissions Inc., Menomonee Falls, Wis.*

New equipment. Practical, specific solutions to the complex problems involved in purchasing and developing new equipment, and reducing the amount of equipment made obsolete by technological change are provided in Special Report No. 14, "Essentials of Machinery Procurement and Development." Price: $2.50 (AMA members: $1.75). 71 pages. *American Management Assn., 1515 Broadway, New York 36, N. Y.*

Fluorocarbon coatings. An independent technical report, "How to Apply and Sinter Fluorocarbon Coatings," by Gene Bartczak, describes coating processes for Du Pont's Teflon, Kellogg's Kel-F, and Acme's Polyfluoron. The report is reprinted from the Sept. 1956 issue of this magazine. Price: 50¢. 16 pages. *Gene Bartczak Associates, 119 Soifer Ave., N. Bellmore, L. I., N. Y.*

Cements for plastics. Technical data on the properties, uses, and applications of seven cements developed by the company for bonding similar plastics, dissimilar plastics, or plastics to non-plastics are given in a new folder. 4 pages. *Schwartz Chemical Co., Inc., 326 W. 70th St., New York 23, N. Y.*

"1957 . . . Silicone Rubber" discusses the basic chemistry, the properties due to this chemistry, and the consideration and compromises involved in compounding silicone rubber for fabrication. The booklet contains a number of graphs and a question and answer section. Price: $1.00. 45 pages. *The Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.*

Packaging economy. Pertinent advice on the designing, testing, and storing of product packages, and individual case histories pointing up cost savings through the use of specific corrugated box designs are provided in a newly revised booklet, "How to Ship More Economically in Corrugated Boxes." 24 pages. *Hinde & Dauch, Sandusky, Ohio.*

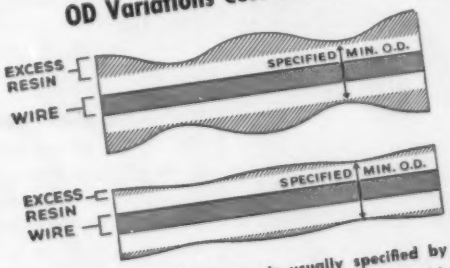
Vinyl-clad metal. Brochure describes Arvinyl, created through a laminating process that bonds textured, printed vinyl to one or both sides of a flat sheet of steel, aluminum, or magnesium and produces a bond between the metal and vinyl so tight that the new product can be processed with standard metal working tools and fixtures without damage to

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the finish. Sample of product is included in brochure. 6 pages. *Arvin Industries, Inc., Columbus, Ind.*

Chemical and process equipment. Catalog No. 14, revised and enlarged, describes dry blending and heat transfer equipment for the chemical and process industries. 16 pages. *The Patterson-Kelley Co., Inc., Warren St., E. Stroudsburg, Pa.*

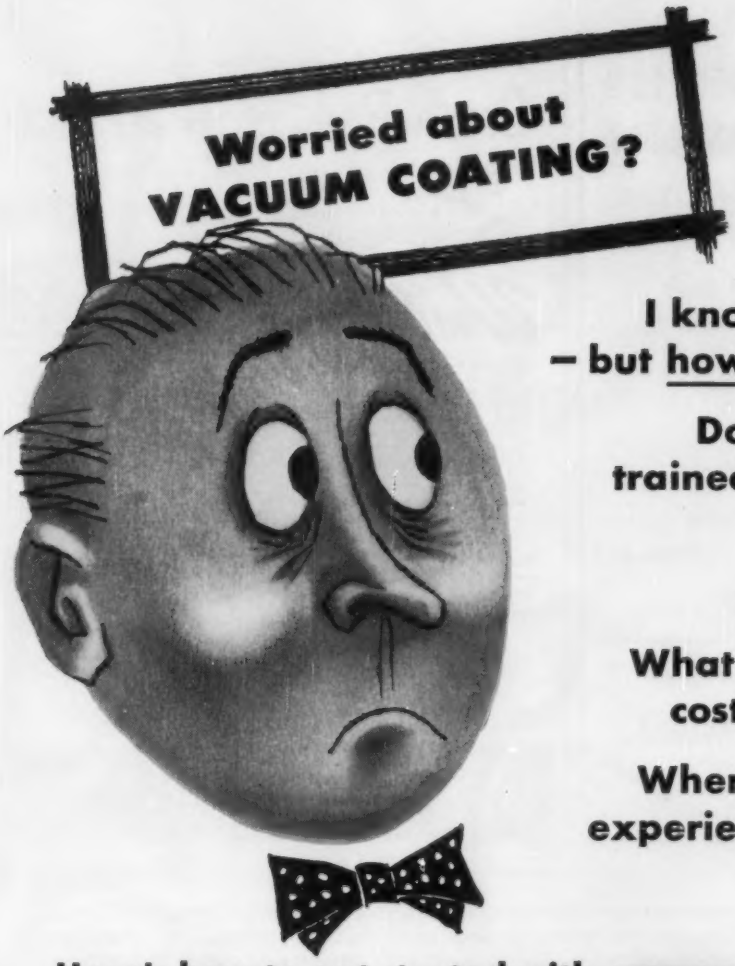
Conversion factors. Wall chart includes common conversions such as inches to centimeters or watts to h.p. as well as many conversions that are difficult to locate in reference manuals (for example, cu. ft. to liters, microns to meters, quintal to lb., etc.). *Precision Equipment Co., 3716 N. Milwaukee Ave., Chicago 41, Ill.*

Foam insulation. Physical properties, sizes, how to install, and finishes to be used are a few of the subjects discussed in a new brochure on Dyfoam, a lightweight plastic foam insulation in long slab form. 6 pages. *Dyfoam Corp., 202 E. Cherry St., New Castle, Pa.*

Hydraulic press platens. Information for platen selection, and a description of the company's precision methods for manufacturing heat-and-pressure-applying platens are given in a bulletin entitled, "R. D. Wood Platens—The Perfect Working Surface for Processing Plastics, Wood Products, Rubber." 4 pages. *R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.*

Polyester. Technical Service Bulletin E-10 describes in detail Witco Fomrez 50, a new polyester for the production of flexible urethane foams, and provides a typical recipe for manufacturing flexible urethane foams with it. 2 pages. *Witco Chemical Co., 122 E. 42nd St., New York City, N. Y.*

Machined components. Brochure on components precision-machined from industrial plastics describes important properties of Teflon, Kel-F, nylon, styrene, etc. Typical applications in the electronic, aircraft, instrument, mechanical, and other fields are il-



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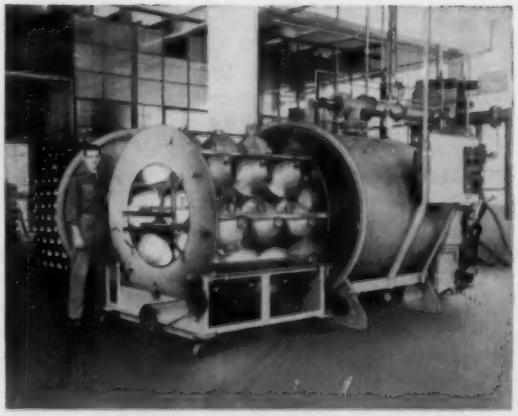
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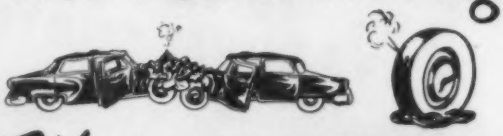
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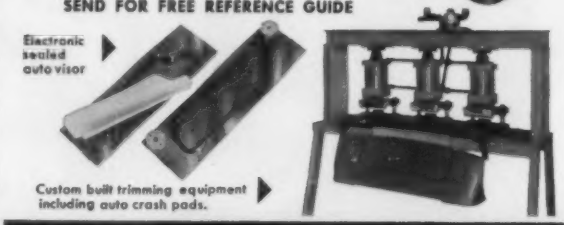


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lustrated. 4 pages. *Tri-Point Plastics, Inc., 175-177 I.U. Willets Rd., Albertson, L. I., N. Y.*

Fire prevention. "Flammable Liquid Hazards in the Plastics Industry" has been prepared by the S.P.I. Committee on Fire Prevention in cooperation with The National Board of Fire Underwriters. 4 pages. *The Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y.*

Control cable gage. Brochure describes continuous, non-contact diameter measurement and control equipment for insulated wire and cable, extruded tubing, and shapes. Equipment described spans the range of 0.4 to 3.0 in. in two standard sizes and up to 12 in. in special sizes. 4 pages. *Industrial Gauges Corp., W. Englewood, N. J.*

Foamed - in - place polymer. Combination catalog and file folder (that can be kept up to date) on foamed-in-place flexible, semi-rigid and rigid Poly-Kool-foam urethane plastics polymers, discusses economics, in-plant applications, electrical properties, bonding and adhesion, impact absorption, strength properties, and thermal conductivity. *The Dayton Rubber Co., Dayton 1, Ohio.*

"Proved by Performance" describes the economical and reliable service provided by pipe made of polyethylene. Specifications for safe working pressure of standard wall pipe, adopted by the pipe industry, are also given. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.*

Multiple knife cutters. Bulletin No. 210 deals with the Series 700 multiple knife cutters designed to cut pellets of uniform size at the rate of 10 tons per hour. 4 pages. *Taylor, Stiles & Co., Riegelsville, N. J.*

Plasticizers. Structure, properties, reactions, and suggested uses for dipentene monoxide and alpha-pinene oxide epoxy compounds that are suggested for use, among others, as plasticizers. Bulletins 81 and 82. *Becco Chemical Div., Food Machinery and Chemical Corp., Buffalo 7, N. Y.*

Reinforced molding compounds. A number of case histories of applications currently in production which utilize Fiberglas reinforced molding compounds and a list of molding compound suppliers. Loose-leaf file folder. *Textile Products Div., Owens-Corning Fiberglas Corp., 598 Madison Ave., New York 22, N. Y.*

Line pipe and well tubing. Specifications, general data, and engineering data on Fibercast line pipe and well tubing made from thermosetting reinforced epoxy resins. 4 pages. *The Fibercast Corp., P.O. Box 727, Sand Springs (Tulsa), Okla.*

"Services and Products Bulletin" lists all of the 67 different types of zinc and alloy diecast and thermoplastic molded products made by the company, and outlines a variety of services it



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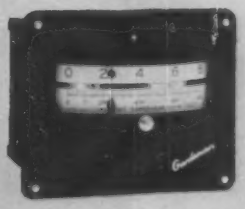
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will undertake on special order. 9 pages. *Gries Reproducer Corp., 125 Beechwood Ave., New Rochelle, N. Y.*

Ethylene polymerization catalyst. Bulletin No. 510 describes new polymerization catalysts for making linear high density polyethylene at low or moderate pressures—mixtures of sodium hydride and titanium tetrachloride prepared from a sodium hydride oil dispersion. 4 pages. *Metal Hydrides Inc., Beverly, Mass.*

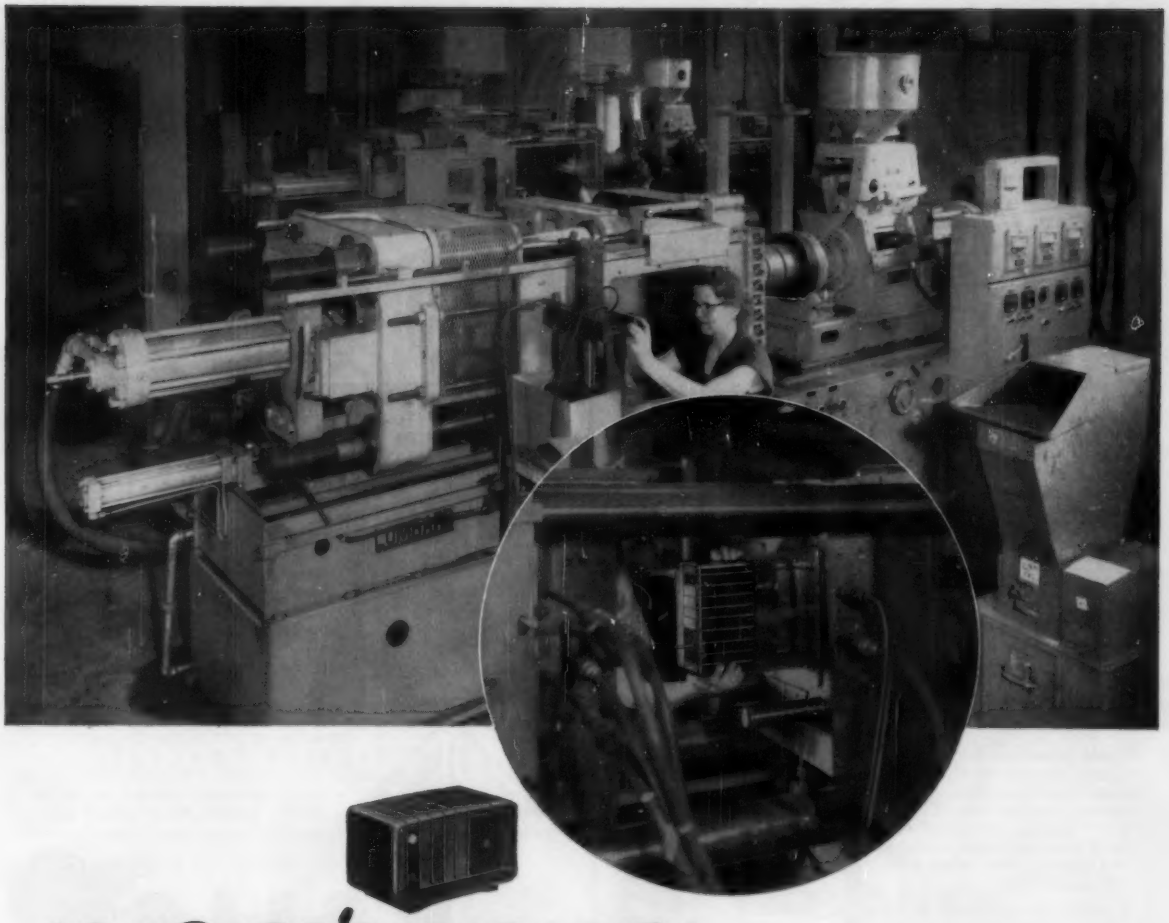
"The Chemical Industry Facts Book," third ed., updates information on virtually every facet of the industry. Profusely illustrated with charts, graphs, and tables, the book is thoroughly indexed, presents a selected reading list, and contains a fairly representative glossary of common chemical terms. 160 pages. Price: $1.25. *Manufacturing Chemists' Association, Inc., 1625 Eye St., N.W., Washington 6, D.C.*

Color concentrates. Four data sheets, Code 1-23-57, give data on new organic and inorganic polyester paste colors, prices, and resin suppliers. *Plastic Color Div., Ferro Corp., 4150 E. 56th St., Cleveland 5, Ohio.*

Tool design. Compression and transfer molding tools are extensively discussed in "Practical Do's and Dont's in Tool Design." 45 pages. *British Industrial Plastics Ltd., Tat Bank House, Oldbury, Birmingham, England.*

"Bibliography on Reinforced Plastics," together with two supplements thus far issued, contains hundreds of listings of literature in publications the world over. 27 pages. Price, including supplements as they are issued: £1. 1s. (ca. $2.95). *The British Plastics Federation, 47-48 Piccadilly, London, W.1., England.*

Electrical insulation. Special Technical Publication No. 188, "Symposium on Minimum Property Values of Electrical Insulating Materials," contains information on electrical, physical, and chemical properties needed to accurately predict their insulating



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properties. 48 pages. Price $1.75. *American Society for Testing Materials. 1916 Race St., Philadelphia 3, Pa.*

Bimetallic extruder cylinders. Engineering and data guide on lined cylinders describes Xaloy, a ferrous alloy surfacing of exceptional corrosion- and wear-resistance. 16 pages. *Industrial Research Laboratories, Div. of Honolulu Oil Corp., 961 E. Slauson Ave., Los Angeles 11, Calif.*

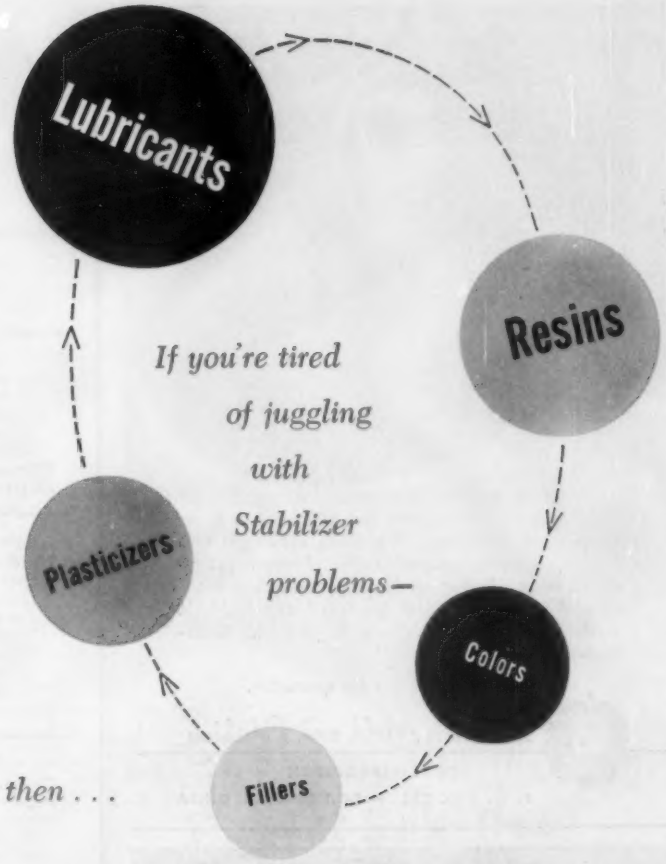
Resistance welding equipment. Applications, specifications, and dimensions of standard welding tips, wheels, dies, and holders, and descriptive and illustrative data on holder-to-tip adapters, quick dis-connect shutoff couplings, seam welder shafts, and bushings. Bulletin RW-10. 28 pages. *Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46, Wis.*

Gasket and shim stock. Booklet and color-coded "size selector" describe washers, gaskets, shims, seals, and spacers made of Color-Plast, an undisclosed thermoplastic material. *General Gasket, Inc., Industrial Rd., Clifton, N. J.*

Industrial tools. Information on standard sizes and pertinent engineering data are given in catalog on machine knives, edge tools, and tool steel specialties. 32 pages. *Alcon Production Tool Co., 579 Baird St., Akron 11, Ohio.*

Pelletized material. Four technical bulletins dealing with Plio-Tuf P100, a new pelletized material for injection molding are titled as follows: 56-65A, "Plio-Tuf P100 for Injection Molding"; 56-151, "Effects of Chemicals on Plio-Tuf P100"; 56-67, "Injection Molding of Plio-Tuf P100"; and 56-68, "Finishing and Lacquering of Plio-Tuf P100." *Chemical Div., The Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio.*

Injection molding machines. Features of Lester injection molding machines, complete specifications, stories of typical installations, and cutaway views of basic components. Bulletin No. 202. 12 pages. *Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio.*



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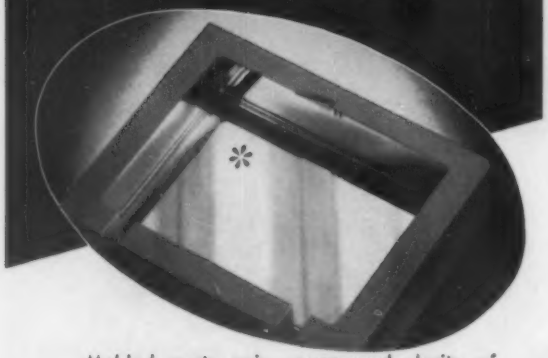
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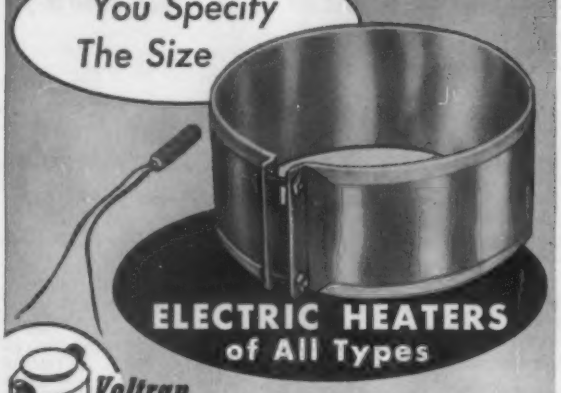
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mp Plastics

Production and sales figures in 1000 lbs.* for January and February 1957

Materials
Cellulose plastics:[a]
Cellulose acetate and mixed ester:
Sheet, under 0.003 gage
Sheet, 0.003 gage and over
All other sheets, rods, and tubes
Molding and extrusion materials
Nitrocellulose sheets, rods, and tubes
Other cellulose plastics
Phenolic and other tar-acid resins:
Molding materials[a]
Bonding and adhesive resin for:
Laminating (except plywood)
Coated and bonded abrasives
Thermal insulation
Plywood
All other bonding uses¶
Protective-coating resins
Resins for all other uses
Urea and melamine resins:
Textile-treating resins
Paper-treating resins
Bonding and adhesive resins for:
Plywood
All other bonding and adhesive uses, including laminating
Protective-coating resins
Resins for all other uses, including molding
Styrene resins:
Molding materials[a]
Protective-coating resins
Resins for all other uses
Vinyl resins, total[b]
Polyvinyl chloride and copolymer resins (50% or more polyvinyl chloride) for:
Film (resin content)
Sheeting (resin content)
Molding and extrusion (resin content)
Textile and paper treating and coating (resin content)[c]
Flooring (resin content)
Protective coatings (resin content)
All other uses (resin content)
All other vinyl resins for:
Adhesives (resin content)
All other uses (resin content)
Coumarone-indene and petroleum copolymer resins
Polyester resins
Polyethylene resins
Miscellaneous:
Molding materials[a, d]
Protective-coating resins[e]
Resins for all other uses[f]

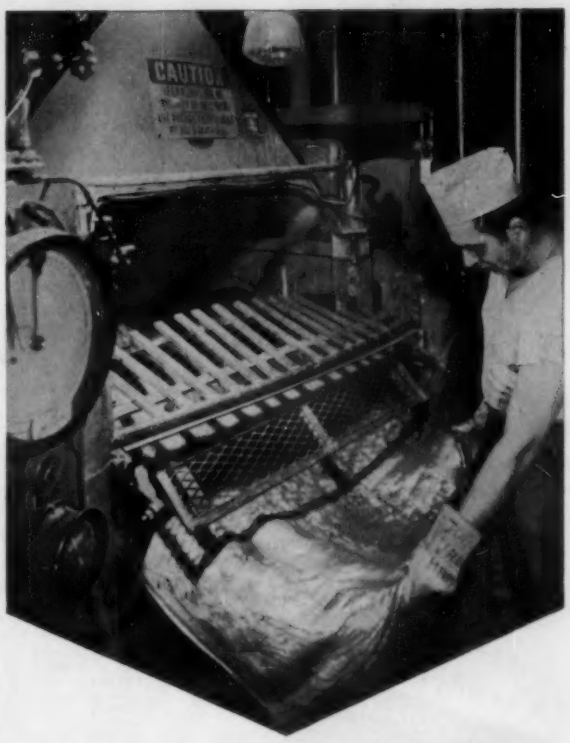
*Dry basis designated unless otherwise specified. †Revised. ‡Partially estimated. ¶Includes friction materials. [a]Includes fillers, plasticizers, and extenders. [b]Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production

Production

From statistics compiled by the U. S. Tariff Commission

January 1957†		*February 1957‡*	
Production	*Sales*	*Production*	*Sales*
1,440	1,310	1,484	1,462
1,438	1,218	1,279	1,253
612	514	529	547
7,456	7,001	7,187	7,041
377	489	429	351
525	308	375	331
17,559	16,675	15,448	14,364
5,212	4,054†	4,734	3,659
1,692	1,670	1,534	1,307
4,459	4,242	3,978	3,831
3,756	2,835	3,774	2,706
4,914	4,416	4,029	3,633
2,710	2,415	2,670	2,024
3,782	3,267	3,566	3,010
3,398	3,461	3,217	3,282
2,546	2,319	2,377	2,172
7,338	7,257	7,250	7,249
2,158	2,269†	2,565	2,118
3,488	2,631	2,836	2,127
7,657	7,875	7,147	6,900
32,296	36,093	33,446	31,783
7,429	6,901	6,893	6,523
11,211	9,875	12,650	9,593
67,096	64,726	64,005	63,120
	8,094		8,669
	5,761		4,564
	18,805		19,805
	6,197		5,137
	5,958		6,221
	3,077		2,682
	3,438		3,258
	2,988		3,255
	10,408		9,529
17,644	18,432	18,320	18,428
7,265	6,444	7,187	6,099
52,394†	53,188	49,800	43,667
4,655	4,512	3,824	3,990
1,170	483	1,190	516
10,174	10,313	9,256	8,935

are given. ᶜIncludes data for spreader and calendering-type resins. ᵈIncludes data for acrylic, nylon, and other molding materials. ᵉIncludes data for epichlorohydrin, acrylic, silicone, and other protective-coating resins. ᶠIncludes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.



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This Thropp 18″ x 50″ Mill compounds colored phenolic molding materials at the Bound Brook (New Jersey) Plant of Bakelite Company, A Division of Union Carbide and Carbon Corporation.

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Plastics in solar stills – an interim report

Under the impetus of government-sponsored research,[1] considerable work has been done over the past few years on the use of plastics materials in solar stills.[2] Aim of all the investigations is to develop a design for the most economical and efficient unit.

Solar stills antedate the advent of plastics by decades, having generally used glass as the condensing surface. Plastics are now being considered in the hope that they may reduce the over-all cost.

Although a portable still using vinyl was developed during World War II, experience gained from its use has found only limited direct application in the current investigations.[3]

Among the films that have been studied under the program are the following: cellulose acetate butyrate (untreated and treated with various vinyl resins); Mylar laminated to polyethylene; Mylar fabric mesh-reinforced cellulose acetate; Mylar; plasticized polyvinyl chloride; polyester; butadiene-acrylonitrile copolymer; and others.[4]

Results to-date are not entirely encouraging. There are several factors that seem to mitigate against the use of plastics in solar stills. First is the poor wettability of these films. This factor acts to reduce the efficiency of the still since condensate tends to form in the shape of drops, many of which fall back into the saline solution, or reflect sunlight. Another shortcoming is deterioration of plastics film in direct sunlight. Studies have shown that in order to be economical, plastics films should have a useful life of at least three years. Some investigators feel that because of these drawbacks glass might be a better condensing surface and prefer to use plastics on the inside (as the "black" material, as channels, tubing, internal framing, and the like).

Films have been treated to improve their wettability; some (PVC and polyesters) have shown promise in regard to weatherability; but results are inconclu-

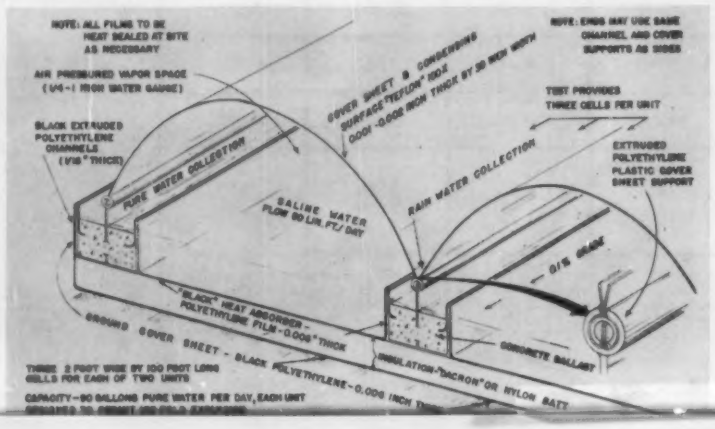
[1] In 1952, the 82nd Congress authorized the Secretary of the Interior to "provide for the development of practicable low-cost means of producing from sea water, or from other saline waters, water of a quality suitable for agriculture, industrial, municipal, and other beneficial consumptive uses on a scale sufficient to determine the feasibility of the development of such production and distribution on a large-scale basis, for the purpose of conserving and increasing the water resources of the Nation." As a result of this authorization, the Office of Saline Water was established and has been sponsoring, evaluating, and coordinating research activities on this problem.

[2] Solar stills are devices for the demineralization of saline water by evaporation, using the heat of the sun as a source of energy. They constitute only one of several methods that can be used for this purpose. The others include electric membrane processes, vapor compression distillation, critical pressure devices, osmotic processes, solvent extraction, separation by freezing, ultrasonic, and others. The Office of Saline Water has sponsored research into all of these methods. To-date, there has been no conclusive evidence as to the superiority of any of them and work is progressing on all.

[3] The inflatable vinyl solar still was developed by Dr. Maria Telkes, based on earlier patents, for temporary emergency use on life rafts during World War II. (See MODERN PLASTICS 27, 67, June 1950.) These stills, though serving their emergency purpose well, were not designed for large-scale, permanent installations.

[4] Cellulose acetate film has found application in osmotic processes of water demineralization; nylon in osmionic techniques; both are being further studied.

Design of a solar still developed by the Du Pont Co. and submitted to the government for building and testing. Curvature of the Teflon film is claimed to reduce incidence of droplet condensation; life of film is claimed to exceed 10 years. (Drawing, Du Pont)



sive. What is still needed, to quote the last annual report on saline water conversion, is a "thin plastics film which is tough, wettable, with high transmission properties, and with excellent resistance to weathering."

Recently, Du Pont has announced a solar still using Teflon as the transmitting and condensing surface and polyethylene as the "black" material. The still is designed so that the Teflon film is bowed outward by slight air pressure. It is expected that the curvature thus obtained will reduce the incidence of droplet condensation. It is also claimed that the useful life of the film is at least 10 years. However, this still is only in the design stage. It will be built and tested by the government. Several other films, claimed by Du Pont to have weatherability of more than 10 years, are also being studied.

Cost of purified water from solar stills, considering all factors, ranges from \$3.50 to 82¢/1000 gal.; Du Pont estimates that its design will yield water at 75¢/1000 gallons. Other purification processes claim costs as low as 50¢/1000 gallons. However, these claims may be reflective of the optimism of their proponents. A recently established method of cost analysis may lead to a revision of these figures. It must also be borne in mind that there has so far been no pilot-plant production from any of the proposed solar stills; pending such production, cost estimates cannot be much more than intelligent guesses. However, pilot-plant output has been scheduled for sometime this year and fairly accurate figures should become available soon. From all appearances the most promising processes so far developed can produce fresh water at costs comparable with maximum present cost of industrial water supplies.

Originally planned to last five years, the program of research has now been extended till 1963. It is expected that conclusive results will have been reached in a few years and the place of plastics in this field clearly delineated.

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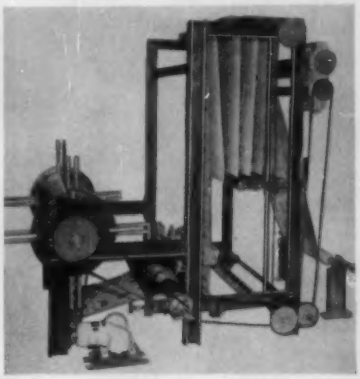
The Liberty Compensator with Turret Rewind

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This Liberty assembly speeds production by minimizing delay at the take-off. It's as easy to operate and as ruggedly constructed as all the other units in the popular Liberty line.

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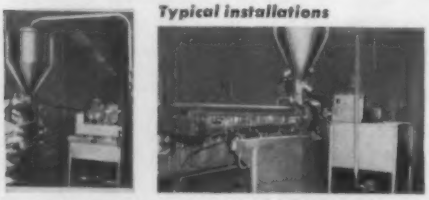
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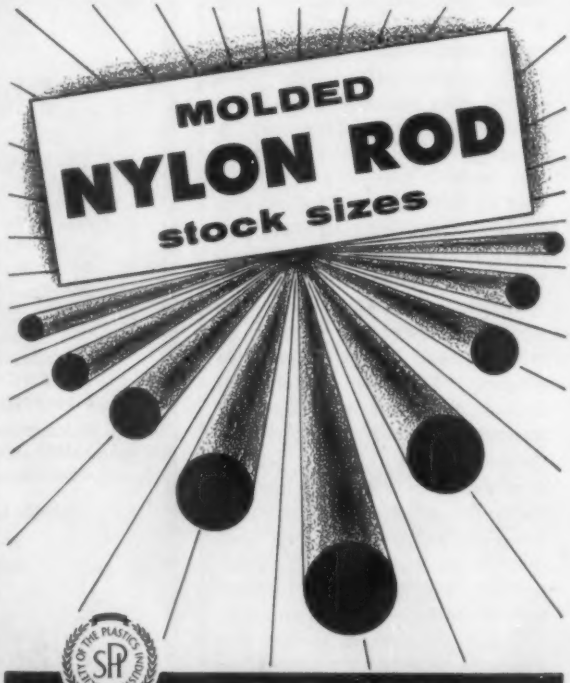
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Acrylic-polyester

Clearly, one way to improve translucent building panels is to increase their clarity. With this object in view, as well as a $3.5 million and growing resin market, Rohm & Haas Co. has brought out Paraplex 444, an acrylic-modified polyester. The acrylic brings the refractory index of the resin closer to that of the fibrous glass reinforcement, making it less visible and the panel more transparent.

Other virtues claimed for the new resin include greater resistance to discoloration by ultraviolet and to "fiber blooming," (where erosion of the polyester exposes the glass fibers) in a weathered panel.

Test samples of panels made with the new resin, after two years under the Florida sun, looked excellent while samples of two "conventional" resins—light stabilized but without the acrylic additive—had deteriorated to a grainy, opaque mass, with the fibers in full bloom.

Like most polyesters, the resin must be blended with monomeric styrene or vinyl toluene to obtain adequate curing speed and the right physical properties. As the resin is supplied, it consists of 75 parts unsaturated polyester, almost water-white, and 25 parts monomeric methyl methacrylate. The molder adds styrene to the mixture. Though as much as 25% and as little as 10% can be added, Rohm & Haas suggests an optimum blend of 80 parts P-444 to 20 parts styrene monomer.

In a cured panel, the ratio works out to 60% polyester, 20% acrylic, and 20% styrene. The resin differs from others in that it cures slightly faster. Another difference is the tendency of P-444 to develop more bubbles, since it does not absorb entrapped air as readily as other resins. The supplier suggests a degassing operation to solve this problem when it occurs.

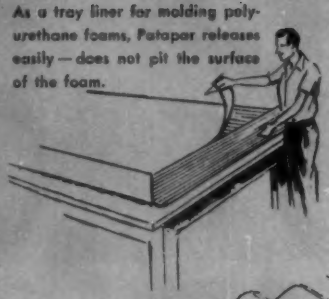
Panels of P-444 are too clear to be matched with others, Rohm & Haas says, citing the case of International Molded Plastics, Cleveland, Ohio, which put out an entirely new line of panels when the resin was introduced.

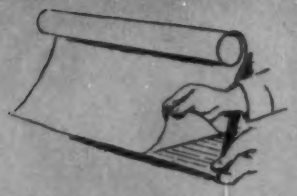
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Patapar® Releasing Parchments

As a tray liner for molding polyurethane foams, Patapar releases easily — does not pit the surface of the foam.





Patapar is the ideal protective backing for pressure sensitive plastics — can be attractively printed for product identification.

In the manufacture of polyester Fiberglas sheets, Patapar provides an efficient release backing. Imparts satin-like finish.

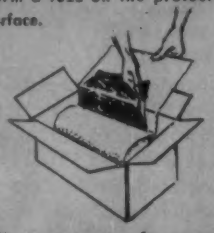




Patapar performs perfectly as a separator for rubber tape. Also used as a core cover.



Ideal as a protective release backing for pressure sensitive surfaces. Fiber-free, Patapar will not form a fuzz on the protected surface.



Effective separator for uncured, natural or synthetic rubbers. Imparts a smooth surface. Resists adhesion build up.

Patapar Releasing Parchments have dense, fiber-free texture – high resistance to penetration or migration of oil and softeners – permanent releasing action. They are totally inert to any surfaces they contact.

They show excellent performance in many processes involving: *synthetic rubbers, polyurethane foams, polyesters, vinyls, organic adhesives, organosols, phenolics, acrylics.*

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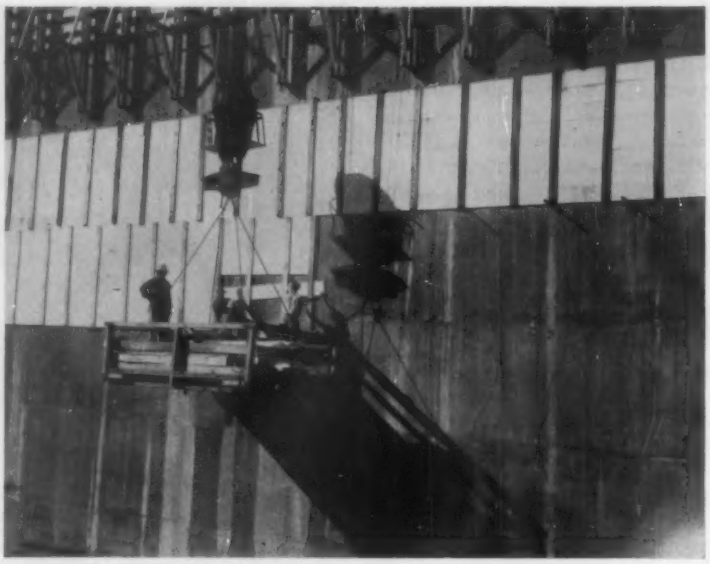
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Foamed styrene planks protect concrete dam structure from rapid changes in temperature. Method pictured has now been superseded by a new technique—foam is nailed to plywood panels, which holds it in direct contact with the concrete and keeps air out

Dam face insulated with foamed styrene

Foamed styrene planks, used to protect large masses of concrete from rapid changes in temperature, have speeded up operations and lowered construction costs at the Table Rock Dam project on the White River, eight miles west of Branson, Mo.

A long and careful search of possible insulating materials resulted in the choice of lightweight foamed styrene boards to replace such conventional materials as thick wooden planks or heavy insulating blankets.

The concrete dam structure is made up of 30 individual monoliths. Concrete is placed in one monolith at a time, in 7½-ft. lifts. The monoliths differ in elevation in the partially completed structure, and the exposed surface of the bulkhead face of each monolith is subjected to rapid changes in temperature during the cold weather, causing it to expand and contract quickly. The hairline cracking of the concrete which results weakens the structure and creates possible sources of leakage.

To protect the concrete from rapid temperature changes, foamed styrene planks, 1 in. by 12 in. by 9 ft., are nailed to panels made of ½-in. plywood sheets spliced together. Originally, panels made only of foamed styrene were used. However, this method did not provide maximum protection, because the material was not held in direct contact with the concrete surface in all places.

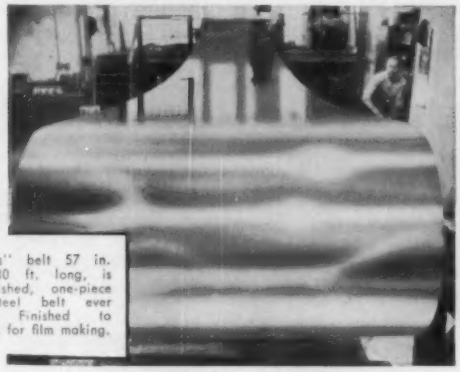
The panels vary in size from 4 by 7½ ft. to 4 by 22½ ft., depending upon the height of the concrete face to be protected. These panels of Styrofoam and plywood are lapped one over another and held in place by vertical walers of two 2- by 6-in. boards. The vertical walers are blocked at the bottom with wedges driven against dowels drilled into the concrete of the adjacent monolith. The top is held in place by anchor-bolts previously set to support the steel forms. The vertical walers are spaced on 6-ft. centers and the entire surface of concrete is completely covered.

Credits: Styrofoam foamed styrene supplied by The Dow Chemical Co., Midland, Mich. Application developed by Morrison-Knudsen Co., Inc., and Utah Construction Co., contractors for the project, working in conjunction with the U. S. Army Corps of Engineers.

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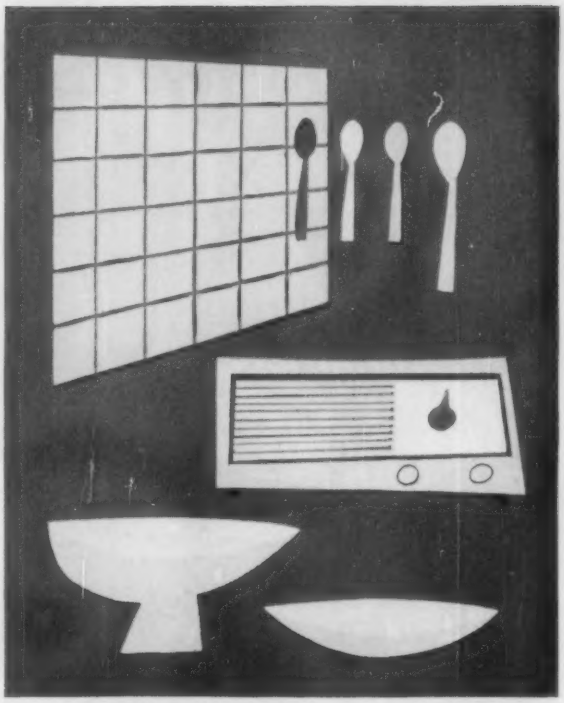
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Design contest

The third plastics housewares design contest held by Koppers Co. this year attracted 223 entries from 67 molders of styrene and polyethylene. Top prizes in the contest, set up by Koppers to promote better design in plastics housewares, went to two firms which split four awards.

Flambeau Plastics Corp., Baraboo, Wis., won Classes 1 and 2 (products for use with food of styrene and polyethylene, respectively), while Loma Plastics, Inc., Fort Worth, Texas, won the Class 4 prize (home maintenance product) as well as the best of competition award.

The judging staff, headed by Dr. Jesse H. Day, editor of *S.P.E. Journal*, omitted the Class 3 award (decorative products of either plastic) this year.

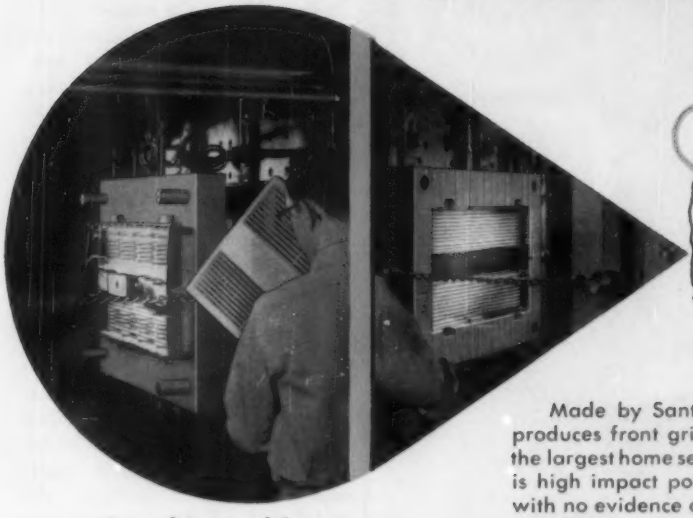
Actual prizes in the contest consisted of three one-year full tuition scholarships and a two-year scholarship for best of competition.

Flambeau Plastics carried Class 1 with a three piece mixing bowl set of high impact styrene that retails for $2.49. The bowls, offered in four colors, were designed by Jack Collins. The company received the polyethylene-food award with a spatula set of three pieces, designed by Harold Hulterstrum, which sells for 59 cents. Loma Plastics won both of its awards with an outdoor polyethylene trash can of 20-gal. capacity. Designed by Paul C. Gunn, it sells for $12.95. It is available in four colors, all of which are supplied with black lids.

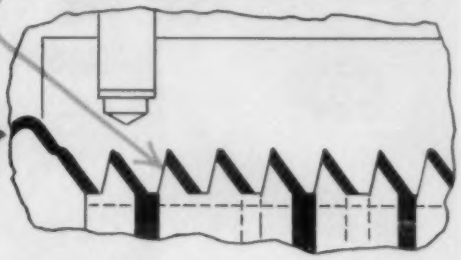
Honorable mention was given to three companies in the contest: Federal Tool Corp., Chicago, Ill., for a styrene picnic knife set; Plas-Tex Corp., Los Angeles, Calif., for a polyethylene ice-bucket; and Republic Molding Corp., Chicago, for a rectangular polyethylene pail.

The scholarships for the top prizes in each category were awarded in the name of the winning molder to accredited schools of design selected by the molder. The students receiving the scholarships are selected by the schools. Entries were judged on design, quality, and imagination.

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The rust inhibitor, a concentrated solution of dicyclohexyl ammonium nitrate, is deposited on the cotton nap backing of the vinyl by a special process developed by the manufacturer. Use of this corrosion inhibitor has previously been limited to porous materials such as kraft papers and canvas. The chemical works by subliming slowly to create a gaseous atmosphere around the metal surfaces. A minimum rust-prevention life of two and a half years is claimed for the inhibitor.

Bags with the treated cloth backing, equipped with zippers, are made in special sizes to hold guns, tools, fishing reels, and similar objects. Covers and blankets will protect larger equipment such as air conditioners, power lawn mowers, and boat motors. Vinyl tarpaulins are available in sizes large enough to cover an entire car for shipment.

Credits: RusToppers manufactured by Westwil Co., Inc., Westport, Conn. VPI corrosion inhibitor supplied by Shell Oil Co.



Vinyl pouch, with cotton fabric backing impregnated with rust inhibitor, protects tools

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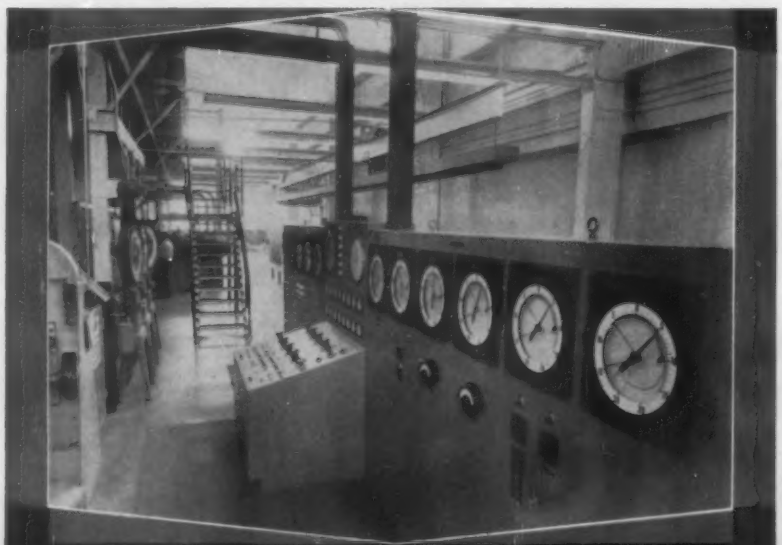
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Look what's happened

(*From pp.* 105-110)

Sunbeam's Mixmaster Hand Mixer (photo p. 109) combines a cast metal motor housing with a handsomely styled, streamlined handle molded of Tenite acetate in a choice of colors, with the control switch located directly under the thumb. Easily read markings show where the switch should be set for various mixing assignments. The end of the handle also serves as a convenient heel rest during pauses in the mixing operation, while its slotted underside also fits over a wall hanger. This handle is produced by Chicago Molded Products Corp.

The Waring RM-2 Mixor, offered by Waring Products Corp., New York, N.Y., has an integrally molded upper housing and handle injection molded of Tenite acetate by Watertown Mfg. Co., Watertown, Conn. (photo p. 109). The "comfort angle" handle has ribs on the underside for a more secure grip. On the lower section of the mixer housing is a molded vinyl pad, grooved so that the appliance can be rested on a bowl edge, leaving hands free.

Use of plastics in kitchen "tool handles"—cutlery, tableware, etc. —is so widespread and well known as to warrant only passing notice. Here both thermoplastic and thermosets are being used, with the automatic dishwasher—water temperatures up to 180° F. and even lighter—as one of the deciding factors in the material to be used.

The kitchen is by no means the only part of the house where plastics handles have virtually taken over. Portable vacuum cleaners such as the Pixie (photo p. 109) models made by Special Products Div., The Hoover Co., use functionally designed plastic handles to make house cleaning chores more pleasant. These handles, with their convenient fingertip control switches, are molded of phenolic.

In the new lightweight Wax-Wiz made by Pionair Products, Inc., Chicago, Ill., the plastic handle (photo p. 110) also serves as a storage reservoir for liquid wax. Fittings at either end of the transparent butyrate tube are molded

of polyethylene. Fingertip pressure releases the liquid through a special non-clogging valve just above the waxing pad. The handle is extruded by Crescent Plastics, Inc., Evansville, Ind.; fittings are molded by Korris Products, Inc., Lyons, Ill.

Despite the wide use of plastics handles mentioned in the preceding paragraphs, there is strong evidence that still other fruitful avenues of development are open. Creative thinking on the part of designers and manufacturers can be counted upon to turn up many other applications where a plastic handle can do a better job.

An excellent case in point is the intricate handle molded by Chicago Molded Products Corp. for the Electric Spray-it Div. of Thomas Industries, Louisville, Ky. Injection molded of black Zytel nylon, this unit (photos p. 110) is not simply a handle but is the complete, one-piece head for a non-professional type "do-it-yourself" paint spray gun sold by Sears, Roebuck & Co.

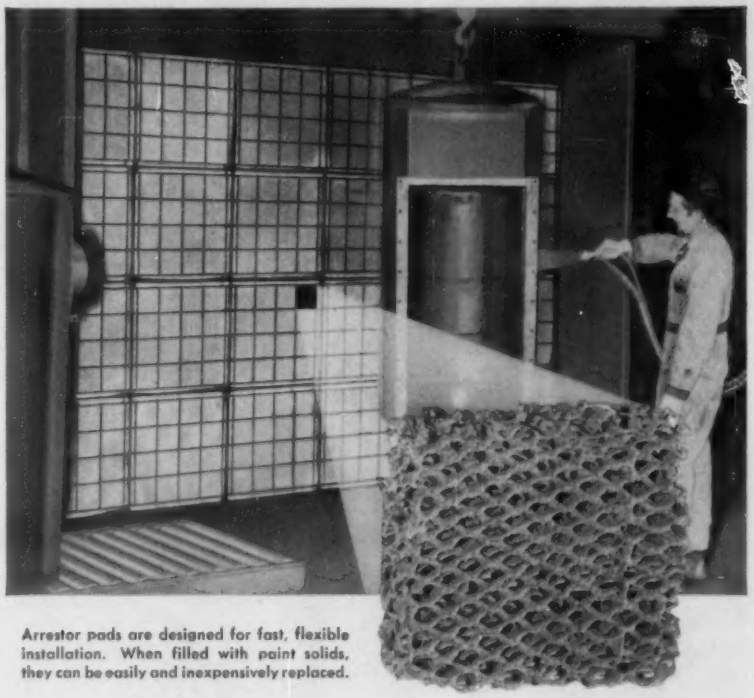
The new plastic handle and head replaces a die-cast, two-piece aluminum unit. Weighing 10 oz. less, the plastic unit makes the sprayer easier to handle and provides better control. The molded nylon part requires only a few minor finishing operations; the previous metal unit required a number. Nylon proved to be an excellent material for this unit because of its moldability, toughness, light weight, and the fact that it is not affected by oils, greases, or alkalis. Dried paint, instead of adhering to the gun as with the earlier metal unit, flakes off easily.

Elimination of finishing operations stems directly from the highly complex mold used in producing this part, which involves the pulling of several cores, internal and external threads, etc.

It is evident that plastics handles of all kinds, sizes, and shapes are here to stay. Just how far they will go—and what new applications may be expected to turn up in the future—seems to depend only upon the ingenuity of the plastics industry and the nation's manufacturers in taking full advantages of the materials and techniques now available.—END

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AUTOCLAVES AND VULCANIZERS. Catalog illustrates and describes line of autoclaves and vulcanizers that can be used for low pressure thermoset molding of large objects. Adamson United Co. (F-702)

COATINGS FOR PLASTICS. Technical data sheet describes lacquers and decorative coatings for polystyrene and acrylic. Includes properties and performance data. Standard-Toch Chemicals, Inc. (F-703)

SHEETS, RODS, TUBES. 18-page brochure describes machining qualities, properties and applications for company's "Astralon" vinyl sheet, rod, and tube stock. Dynamit-Actien-Gesellschaft. (F-704)

PHENOLIC RESINS. Bulletin describes properties, solubility with chemicals of two phenolic resins. Also includes processing and application data. BASF. (F-705)

DECORATED MYLAR FILM. File-size folder contains sample swatches of metallized and embossed Mylar laminated to such backing materials as vinyl, butyrate, fabric, latex, paper. Physical and chemical properties are described. Coating Products. (F-706)

POLYETHYLENE SPECIFICATIONS. 16-page booklet contains specifications data, including resistance to chemicals, resistance to weathering, color characteristics, and general, mechanical, and electrical properties of "Tenite" polyethylene. Eastman Chemical Products, Inc. (F-707)

VINYL FOAM. 14-page brochure describes applications and limitations of "Vinylfoam", particularly suitable for cushioning, safety applications. Elastomer Chemical Corp. (F-708)

EXTRUDERS. 8-page booklet contains comprehensive description and illustrations of line of extruders with 2 to 6 in. screw diameters. Contains blueprint with detailed specifications. John Royle & Sons. (F-709)

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ELECTRIC CARTRIDGE HEATERS. Illustrated folder describes line of cartridge heaters for applying localized heat to work areas requiring close thermal control such as dies, platens, molds, processing equipment. Edwin L. Wiegand Co. (F-712)

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HEAVY DUTY MILLING MACHINE. 8-page booklet describes milling and die sinking machine that can machine large molds. Available in models with working surfaces ranging from 28 x 83 to 28 x 143 in., and a 30 in. cross travel of cross slide. The Cincinnati Milling Machine Co. (F-716)

HEATING CYLINDERS FOR INJECTION MACHINES. 32-page booklet describes company's extra capacity heating cylinders. Design to increase ratings on out-dated injection machines. Discusses construction, operation, installation, and maintenance. Injection Molders Supply Company. (F-717)

EXTRUSION COMPOUND FORMULATIONS. Technical bulletin describes eight formulations of PVC-50, a polyvinyl chloride polymer. Includes extrusion compounds for clear and opaque garden hose, shoe welting, and medical tubing. Chart includes physical properties. Diamond Alkali Company. (F-718)

SMALL INJECTION PRESS. 28-page brochure describes line of small (one ounce or under) vertical presses for injection molding. Models are available with air or hydraulic systems. Specifications, price schedules included. Newbury Industries, Inc. (F-719)

ADHESIVE AND COATING MATERIALS. Technical bulletin gives data about a series of polyvinyl acetate emulsions displaying excellent adhesion to a wide range of base materials. Lists specifications and characteristics, discusses special advantages of each item in the series. Polyvinyl Chemicals, Inc. (F-720)

FILM FOR SILK SCREENING. Illustrated folder describes a solvent adhering film for silk screen process printing. Ulano Products Co. (F-721)

POLYESTER RESINS. Literature describes line of polyester resins for hand layups, gel coats, matched molding, casting, and laminating, and provides specifications for resins in liquid, catalyzed and cured stages. Mol-Rez Corporation. (F-722)

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THERMOPLASTIC SHEET AND EXTRUDED SECTIONS. File folder contains price lists, illustrated data sheet and comparative properties chart for thermoplastic materials extruded and molded by this company. Southern Plastics Company. (F-730)

SLITTER-REWINDER. Illustrated folder describes principal features of unit adjustable for score cut, razor blade, or burst cut slitting, and rewinding of film, foil or paper. John Dusenbery Company, Inc. (F-731)

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COLOR VARIATIONS IN PLASTICS. Service bulletin describes causes and remedies for color variations in plastics materials, resulting from such sources as pigment separation, poor application, improper selection of pigments. Logo, Inc. (F-735)

COMPRESSION MOLDING PRESS. Illustrated folder describes 25 and 50 ton models of completely automatic air toggle powered compression press that requires no operator. Automatic Molding Machine Co. (F-736)

ROTATIONAL MOLDING OF PLASTISOLS. Literature describes units for rotational molding of vinyl plastisols. Consists of gas operated oven with two 24 to 30 in. diameter mold holders mounted on a planetary drive. Also describes accessory equipment. Mercury Conveyor, Inc. (F-737)

TESTING APPARATUS. Folder contains illustrations of line of testing apparatus including abrasion testers, hardness testers, resilience testers, thickness gauges, and laboratory ovens. Testing Machines, Inc. (F-738)

TEMPERATURE CONTROLLER. Folder contains illustrations and specifications for line of electronic temperature indicating controllers, which operates with on-off, proportional, or adjustable differential controls. Fenwal, Inc. (F-739)

DRY COLORING OF THERMOPLASTICS. Folder reviews coloring characteristics of common thermoplastics. Describes company's line of colorants, metallic colors, and also describes color dispersions for polyester and epoxy resins. Plastic Molders Supply Company, Inc. (F-740)

INSULATING MATERIALS. File folder contains detailed information on various grades of "Mycalex" glass-bonded mica material, and "Supramica" ceramoplastics, formulated of synthetic mica and glass. Mycalex Corporation of America. (F-741)

TRANSFER MOLDING PRESS FOR SMALL PARTS. Illustrated data sheet describes automatic 15 ton transfer molding press with mold dimensions of 2 x 5 in. Hull-Standard Corp. (F-742)

EXTRUDER PACK SCREENS. Literature lists prices for extruder packs screens available in steel, brass, monel in 2 to 200 mesh. Sample screen is attached to literature. George A. Williams & Son. (F-743)

INDUSTRIAL USE OF RADIATION. Folder describes service for providing consultation, analysis, materials testing on use of radiation in industrial applications. Radiation

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Plastics fly high

(*From pp.* 111-114)

can reach heights of 120,000 ft. and remain there for as long as 10 hr., making it possible to capture vital data on the primary cosmic rays. Rockets can reach higher altitudes, but their great speed and the fact that flights are of relatively short duration limit their usefulness for this work.

Rockets have also been successfully launched from plastics balloons at high altitudes. For example, the Deacon rocket, launched from one of the General Mills Skyhook balloons at an altitude of 75,000 ft., reached a height of 60 miles; the same type rocket launched from sea level has ascended only 20 miles.

As a preliminary to their record-breaking 76,000-ft. ascent in a sealed metal gondola last fall, Malcolm D. Ross and Lieut. Commander Morton L. Lewis, veteran Navy aerologists, reached an altitude of 40,000 ft., riding in a specially constructed reinforced plastics gondola carried by a General Mills Skyhook polyethylene film ballon. In this flight, the observers photographed contrails or vapor trails at close range with special time-lapse cameras. Measuring approximately 66 in. long, 38 in. wide, and 28½ in. deep, the gondola had a shell weight, with seats, of approximately 115 pounds. A 1-in.-diameter aluminum tube around the top served as an edge reinforcement. The gondola has carried gross loads, including two men and assorted equipment, of about 2000 pounds.

While the balloon fabrication techniques used by Raven Industries, Inc., are essentially similar to those outlined earlier, one novel approach consists of carrying scientific equipment on top of the plastic balloons. Recently a Raven Industries balloon fabricated of 0.00075-in. film reached an altitude of 105,000 ft. with a gross load of 173 pounds. A special feature of this flight was a top-mounted spectrograph carried on a spike on the crown of the balloon. When the flight was terminated, the bottom load pulled the spectrograph unit off the spike and the loads parachuted to earth.

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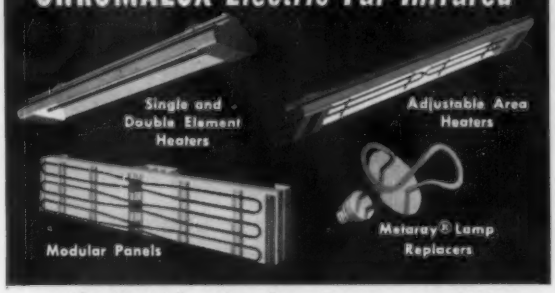
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search, Inc., most of the work to date has been done with polyethylene film. However, it is understood that use of Mylar is also being studied.

In the 300 ft. long Winzen building, the polyethylene sheets are drawn out on a long table and some 60 sheets are heat-welded together to form the balloon, with glass filaments enclosed in the seams. These seams extend from the dome of the balloon all the way to the bottom, where they are continuous with a series of 60 nylon cords. The cords are fastened to a forged steel ring, to which is also attached the top of a silk parachute. The parachute shrouds carry the balloon's cargo. When the balloon comes off the table, it contains some 3 miles of 1 yd. wide polyethylene film approximately 1 mil in thickness. Fully inflated in the stratosphere, such a balloon has a diameter of about 175 ft. and a gas capacity of over 2 million cubic feet.

Probably the most important new development in the entire plastics balloon program is the use of Mylar polyester film instead of polyethylene. The balloon which last September rose from Anoka airport near Minneapolis and reached a maximum elevation of 27 miles before coming to earth near Lexington, Ky., almost three days later, was fabricated of Mylar film only about one-fourth as thick as that used in previous plastic balloons. Built by G. T. Schjeldahl Co. and flown under University of Minnesota sponsorship, the balloon was of "tetroon" design and looked like a triangle when viewed from below.

The record-shattering balloon had an interior volume of about 1 million cu. ft. and weighed only 110 lb., compared to 550 lb. for previous plastic film balloons of comparable capacity.

In pioneering polyester films for balloons, Schjeldahl ran into some rather thorny problems. Foremost was the fact that, unlike polyethylene film, Mylar could not be adequately sealed directly through application of heat. Mylar heat seals, the company found, tend to become brittle. The problem was evenually solved by the development of a thermoplastic sealing tape.

Schjeldahl also found it necessary to fabricate Mylar film by using a lap or shear type joint (see sketch, p. 114), since a fin joint tends to fracture the material under shock loading. In fabricating, sheets are laid so that the edge of one sheet overlaps that of the adjacent sheet. The tape is then placed between the overlapped edges and the seam is completed with a conventional heated wheel sealer.

Sky's the limit!

With other companies now also experimenting with various film, including heat-sealable coated polyester films, for balloon fabrication, it is difficult to predict how much higher these gas-filled space explorers may climb in attempts to extend man's knowledge of high altitude weather conditions and other phenomena. As materials and fabricating techniques improve, no holds are barred and the sky's the limit!—END



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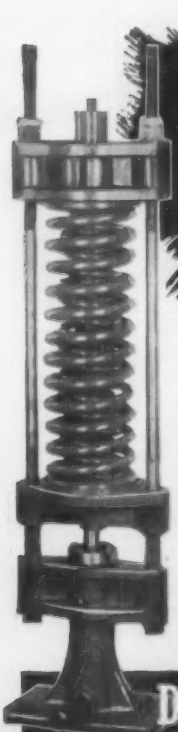
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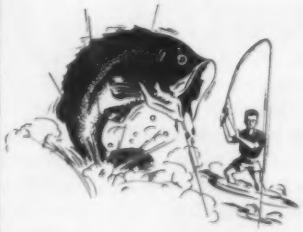
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A critical look

(*From pp.* 120-123)

an equal weight of fibrous glass will be necessary for the production."

On the military side, there is insufficient information in the published literature to reveal the potential use of reinforced plastics pipe in military applications because these are largely classified. About all that can be said is that the attractiveness of reinforced plastics from the standpoints of low weight, resistance to corrosion, non-magnetic qualities, etc., has resulted in many reinforced plastics items for military use. Continuing investigations indicate the high interest in the material from the military side.

Availability

When the availability of reinforced plastics pipe is examined it is found that there is an inadequate supply of the product from several standpoints. Table I was compiled from replies to questionnaires sent to over fifty plastics laminators. Some information has also been added from indirect sources. Less than half of the firms listed are "in production." Furthermore, only five of the firms in production have well-defined end products and applications. Only two of the producers listed have approached standardization of both pipe and fittings, judging from their published literature.

With these facts as a basis, can it be foreseen that, even if the number of producers is doubled or tripled, the 1960 market predicted by Stein (8) could be satisfied? Quite obviously, production rates of the basic processes would have to be speeded up, or manufacturers would have to multiply many times their production mandrels and wrapping machinery, the latter requiring large capital outlays. A far better and more fruitful approach would undoubtedly be in the application of new engineering principles.

New engineering needed

In contrast to the manufacturer of pipe, the plastics pipe maker has to "alloy" the component materials in his operation as he goes

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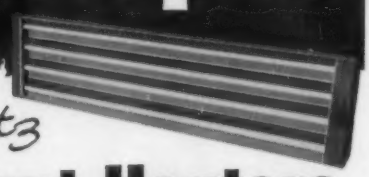
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along. Since the mechanical methods of Stephens (2) and Francis (3) have changed but little over the years, it is apparent that those good pipe products which are now available can be attributed to the fabricators' selection of materials and the control of the many variables that are peculiar to their individual forming methods. Here there is still great room for new engineering, if the advance in technology mentioned by Stein (8) is to be accomplished.

Variables of fabrication

Kellam (7) lists fifteen of the important variables with which pipe fabricators must contend. These are: 1) The resin base. 2) The variation of the resin from batch to batch, or shipment to shipment. 3) The nature and quantity of alloying resins. 4) The nature and quantity of viscosity control additions. 5) The nature and quantity of fillers. 6) The nature of the inhibitor. 7) The nature and quantity of the hardener. 8) The manipulation technique of the fabricator. 9) The curing cycle; the degree and rate of exotherm. 10) Contamination of resin or reinforcement. 11) The ratio of resin to reinforcement. 12) The nature of the reinforcement. 13) The chemical treatment of the reinforcement to aid bonding. 14) Air bubbles or voids. 15) The temperature duration of post cure.

In pipe making, the common variables of flat lamination are compounded by the requirements of cylindrical lamination. This fact, alone, increases the difficulties of controlling such variables. A critical look at the above list gives rise to the thought of trying to separate the simple variables from the difficult ones, disregarding for the moment the feasibility of doing so. It is apparent that variables 8, 14, and 15 apply particularly to the mechanical process, while the rest concern the component materials. Could such a division possibly be a basis for some new engineering of manufacturing procedures?

Suppose that the worst of the variables already considered could be totally divorced from the actual pipe-forming procedure. Then there would be the following steps around which equipment could be planned for mass production of plastics pipe on a scale to match that of metal pipe:

a) Alloying. In this process, the fibrous glass and the laminating resin would be brought together to produce a partially cured material for almost universal use in the further production of reinforced plastics products. For pipe making, the material would be in the form of ribbon or tape with continuous parallel glass fibers running lengthwise and loaded with sufficient void-free resin to produce a homogenous pipe wall by heat and pressure.

b) Forming and curing. The pipe maker would now be truly a fabricator. No longer concerned with the chemical problems of resins, catalysts, glass finishes, etc., he would buy appropriate grades of glass-resin tape from the alloying factory. Each roll of the material would be appropriately identified by processing data



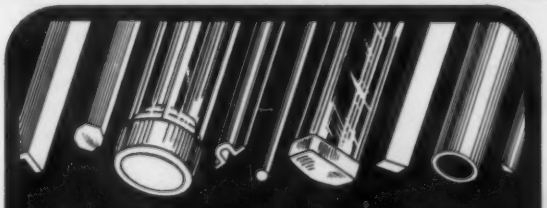
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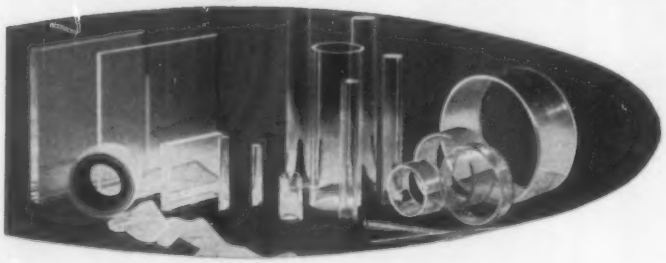
In operation, the filter cone is kept loaded about half full of material. As the material is used, it drops through the bottom of the cone into the hopper throat and is replenished automatically in the cone by the hopper loader. The upper part of the cone acts as a filter, collecting the dust on the inner surface. The filter cones are replaceable at small cost.

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to assure uniform, high quality pipe at the end of the production line. The actual forming machinery could be a modification of the mandrel wrapping process, but the elimination of the usual laminating variables and the availability of pre-alloyed production materials would permit continuous type manufacturing equipment.

Considerable justification for this proposed rearrangement of pipe-making steps can be gained by a consideration of the actual improvement in material properties that are contributed by control of the glass-resin alloying variables prior to laminating.

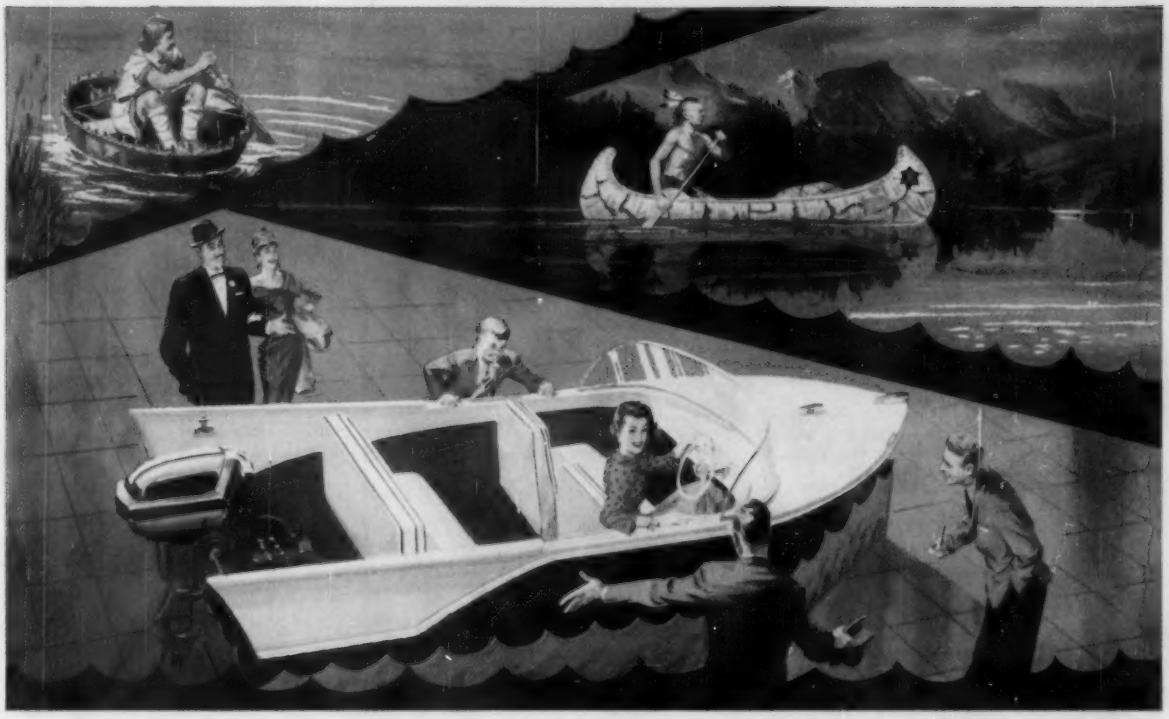
The importance of glass fiber as the load-bearing element in reinforced plastics laminates was recognized by Tallman (9) who developed a glass fabric of bound paralleled fibers "having the fibers . . . all disposed in the position best to assume the loads resulting from stresses to which laminates . . . may be subjected."

Continuing the concept of parallel reinforced fibers, Outwater (10) shows that in laminates reinforced with continuous glass strands, the load carried by the resin is less than 8% of the total load. Both Tallman and Outwater consider the performance of reinforcing glass fiber in tension and this is an important concept as applied to glass in pipe structures. The question arises: "Just how much do we work the glass in pipe?" In other words: "What part of the full fiber strength are we taking advantage of?"

A study of this question in relation to a number of flat laminates and glass-reinforced pipe brings out quite a spread of values. It also shows high preference for glass-resin alloying ahead of fabricating, thereby capturing a large share of the intrinsic strength of the glass.

The tensile properties of a number of laminates are given in Table II, which also includes calculated values of the strength of fibrous glass alone. These values were arrived at by allowing a reasonable value for the strength in proportion to glass content by volume. Actually, these values represent the effective glass utilization or glass efficiencies for the

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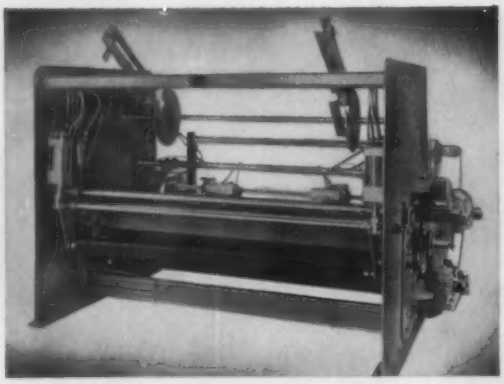
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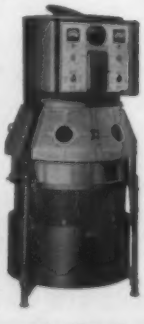
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different types of laminates. Glass efficiencies could be expressed in percentages if the 100% strength of glass in the laminate form were known. For example, if the figure of 400,000 p.s.i. quoted by Sonneborn (11) is taken, the glass efficiencies of specimens No. 1 and No. 7 are 13.5% and 83% respectively. The logical conclusion here is that in the laminates having low glass efficiencies, a fair share of the glass is "going along for the ride," because of wet layup processes, whereas such lost fibers are captured and put to work in the No. 7 laminate.

A similar set of figures for glass-wound pipe is shown in Table III. As in the flat laminates, the actual glass strength values, here tabulated as "Hoop stress (glass) p.s.i.," vary quite widely and again give a good picture of glass utilization for the various reinforcements and types of layup. In the wet layup class, the superiority of filament-wound structures is quite clearly shown. It is interesting to note that continuous braided filaments in type No. 2 result in much lower glass strengths than in the filament wound structures, probably because of better fiber tensioning in the true filament winding process.

Finally, a greater superiority is seen in the preimpregnated-tape-wound structures. While the actual glass strength values may appear high, they are comparable with the other values for pipe in this table and for flat laminates in Table II. This again points to a pre-alloyed structure which by actual test shows close to 100% glass efficiency.

Conclusions

Glass reinforced plastics pipe can be considered a standardized product only from the standpoint of individual manufacturing methods of the relatively few active producers, and not from the standpoint of its present distribution and application on a national scale.

The present survey shows that there are presently not over seven active producers of glass reinforced plastics pipe. They are working in a narrow field with a large potential market that, it is foreseen, will increase rapidly

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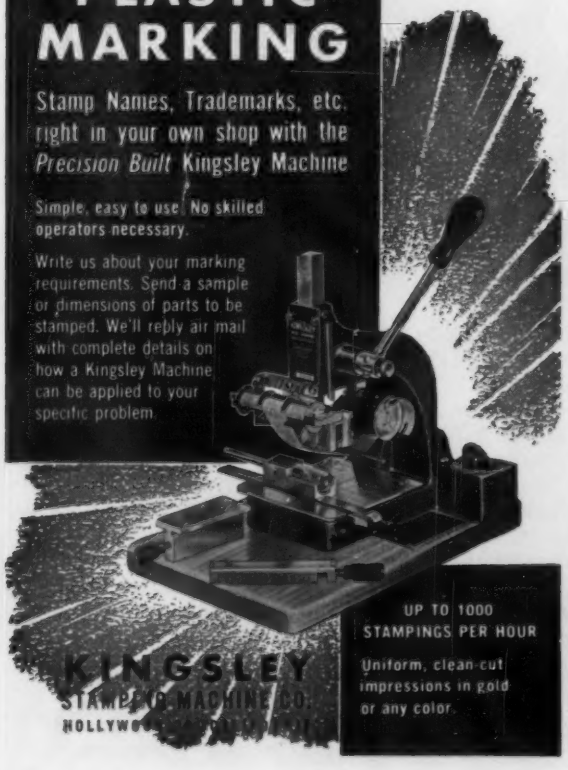
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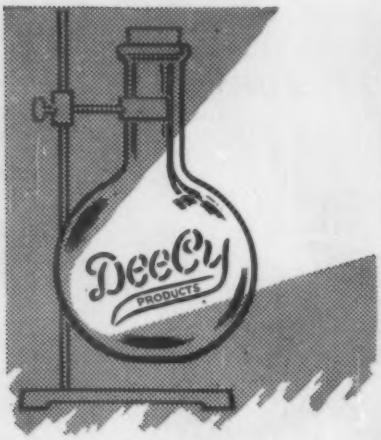
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year by year, widening the gap between demand and supply, unless great advances are made in plastics pipe technology. In addition to these producers, there are some ten other firms in the "development" or "pilot plant" status.

Pipe fittings and joint making also present serious problems. Reinforced plastics pipe developers are not generally developing both pipe and fittings in parallel programs. But at least two have fittings to go with their plastics pipe.

The limitations of present reinforced plastics pipe fabricating processes in supplying a wide-open market for the product suggest that new engineering should be applied to a rearrangement of manufacturing procedure to standardize the production of pipe component materials separately from pipe forming methods. Thus the fabricator would be given freedom for mechanization. This would bring about greatly increased production rates, improved quality, and uniformity of product; it would also open the way for standardization of glass reinforced plastics pipe.

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Fatigue properties

(*From pp.* 163-186)

The straight line (modified Goodman line) is then expressed (4) as

$$\frac{S_a}{S_e} = 1 - \frac{S_m}{S_c}$$

Since nearly all of the data are below the straight line, allowable stresses obtained by the modified Goodman line would be too high.

Conclusions

Data presented in this paper show the fatigue characteristics at a frequency of 900 cycles per minute of a number of typical laminates and the effects on these characteristics of a number of factors that may affect design. Not all the trends are clearly defined, but a few generalizations are indicated by the data.

1) Differences in reinforcements have less effect on fatigue strength, particularly after many cycles, than they have on static strength.

2) The effect of moisture absorption on fatigue strength is less than on static strength. Moisture effects appear to vary with resin type.

3) A stress concentration, such as the hole used in this study, generally reduces fatigue strength. The magnitude of the reduction, however, varies considerably with the material and with the conditions of test.

4) The materials tested do not appear to have reached an endurance limit at 100 million cycles, except for specimens tested at 45° to the warp direction. They reached an endurance limit at about 40,000 cycles at room temperature. Thus, the fatigue strength values at 0° and at 45° to warp tend to be similar after many cycles.

5) Elevated temperatures tend to reduce fatigue strength, even that of laminates made with heat-resistant resins. The effect of elevated temperature tends to decrease with an increasing number of cycles.

6) An increase in the mean stress applied decreases the amplitude of the alternating stress that can be sustained for a given number of cycles. When the compressive strength of the material is low compared with the tensile strength, the amplitude of the alternating stress may be further reduced; this is particularly true in the case of small mean tensile stresses.

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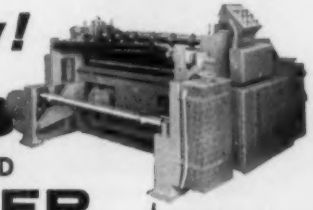
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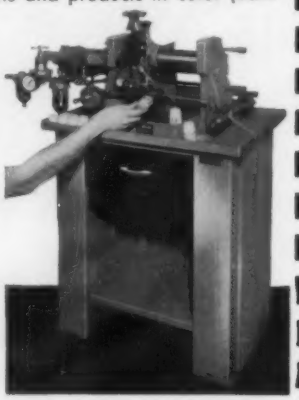
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Plastic laminate

(*From pp.* 188-192)

F. However, from the spectral reflectivity curves on the material which we have used in our "101" and "602" coatings we find that there is no evidence of substantial variation in reflectivity down to below 5000 A, which is the lowest wavelength we would find in the heat range.

The 101 coating is a general-purpose coating which we used on the samples described in Table III. This coating consists of aluminum covered with a thin protective inorganic coating. While this coating is damaged by salt spray and alkalies and is adversely affected by continuous outdoor weather exposure, it should operate continuously without deterioration at 1200° F.

The 102 coating consists of aluminum flake dispersed in a heat-resistant matrix and baked on. While it has a considerably higher emissivity and hence lower efficiency than the 101 coating, it is completely unaffected by salt spray. Our weathering tests on this material thus far indicate no substantial deterioration.

The 602 coating is gold or virgin metal. It is unaffected by temperatures up to 1800° F., which is the maximum we are able to reach in our equipment. While the emissivity and "furnace door" test results indicate no greater efficiency for the 602 coating than for the 101 coating we have found considerably less deterioration to a laminate coated with 602 than we did to a laminate that had been coated with 101 on extended heating to 1500° F.

We are currently able to supply heat shields with our 101 and 602 coatings to a maximum size of 36 by 48 inches. Heat shields with the less efficient 102 coating are limited in size only by our ability to mold the base laminate. It is anticipated that heat shields with 101 and 602 coatings should shortly be available in flat sheets to a size of 48 by 84 inches.

Plastic laminate heat shields have a multitude of applications. Wherever the shield can be installed so that it is not in direct contact with the hot body that is the source of heat, it offers an excellent opportunity, by reflecting a substantial amount of the heat, to prevent the passage of heat to a component or area to be protected.

The high emissivity of the uncoated "cold face" enables the plastic laminate heat shield to readily give up the heat that is not reflected and prevents excessive build up of heat in the laminate. This phenomenon permits the plastic laminates with a reflective coating to be exposed to temperatures that are considerably higher on the "hot face" than had been previously considered possible.

This concept of protecting vital heat sensitive components offers to the engineer a new design medium. Most of the applications thus far for plastic laminate heat shields have been in the aircraft or missile field. The principle, however, is so sound that it is expected that commercial applications will be found.—END

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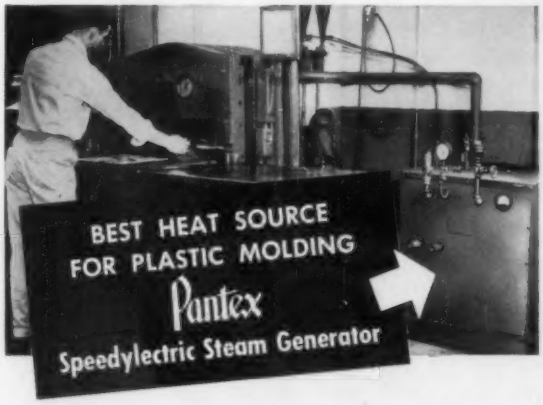


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The Plastiscope

News and interpretations of the news
By R. L. Van Boskirk

Section 2 (*Section 1 starts on p. 37*)

Plastics examined by chemical developers

The plastics industry got an earful of comment at a recent meeting of the Commercial Chemical Development Association in New York. The comments touched on the quality of its product, what the consumer thinks of it, the problems involved in trying to make a profit, how it has stretched out to become a highly complex industry, how big it is, and many other diverse angles.

After listening to various speakers try to measure the size of the industry by either volume or dollars, it seems clear that efforts made to measure plastics growth by percentages or projection curves are as futile as trying to eliminate the curl in a pig's tail.

One speaker, for example, came up with the gloomy assertion that the plastics growth rate was decelerating because his chart showed a leveling off in the 1947 to 1957 period, compared with the 1937 to 1947 period. To a plastics man that seems as incongruous as comparing the time it took to build an auto in 1905 with what can be done today.

Another speaker feared for vinyl chloride's future because it grew only 15% (he said) in 1956 compared with 30% for polyesters. Yet the truth is that that so-called 15% growth was almost equal to the total poundage of the polyesters used in reinforced plastics.

Still another speaker was enthusiastic because the plastics industry's products for home building, construction, and transportation could keep pace percentagewise with population growth. Sales managers for vinyl, polyethylene, polyurethane, styrene, and other plastics will be interested in that "gloomy" prediction; if their sales don't mount *faster* than population growth, they will all be looking for new jobs.

Misleading percentages. Sometimes it is impossible to use anything else in measuring growth, but percentages can be horribly misleading unless carefully used. They are deceiving when used to compare the growth of a plastic that shoots upward from zero with one that is already established but still growing; unfortunately, such comparisons are sometimes made. It is like trying to compare the 2 million-ton synthetic resin and plastics industry with the 120 million-ton steel industry.

Speakers at the CCDA meeting who stuck to "pounds" for a measurement of plastics were on much firmer ground than the percentage users. A good solid figure was the 3 billion-lb. figure for 1956 used by one speaker who left out the billion or so pounds of resin used for surface coatings which he qualified as "not generally associated with plastics." He compared plastics with the 3 billion-lb. sales of aluminum and copper and 2 billion for slab zinc in 1956. He also pointed out the danger of projection lines by showing that if the 1956 sales had been projected from 1942 sales, the total in 1956 would have been only 650 million pounds. He refused to be pinned down on the Paley report that plastics (without alkyds) would reach 18 billion lb. by 1975.

6 billion lb. by 1960. Another speaker estimated that plastics and synthetic resins (including surface coatings) may reach 6 billion lb. by 1960 or a per capita consumption of from 32 to 35 pounds. He said there are now 5000 individual plastics molders and extruders and some 50 raw materials suppliers (another man said 150). He stated that a polystyrene producer today requires an investment of some $600 to $800 per ton annual capacity or around $12 million minimum for an economical size plant. Another few million would have to be available for working capital, inventories, and such. At today's prices, annual sales might be of the order of $10 million. Then there must be large research facilities with an investment of $30,000 per man and an additional annual expense of $20,000 for each man's operation. Then, if the producer discovers anything worth while, a pilot plant must be set up which would cost $25,000 per month. After much other expense to establish a commercial plant, the supplier will have up to $3 million invested in research as well as 3 to 10 years' time during which material has been practically given away to get customers interested.

Increased industrial use. The possible increased industrial use of plastics for construction purposes faces tremendous difficulties even if it were not faced with the fundamental problem of changing people's minds about using conventional materials, said the above speaker. If an increase in such use is to come, it is likely to take place in these ways: 1) material suppliers may acquire fabricating facilities; 2) some of the house construction material firms will acquire plastics plants; and 3) larger molders may push their way into the field.

The speaker said further that the first group is not too anxious to enter fabrication unless forced by economic reasons; the second group would do so only to protect their existing business and would not push it in competition with existing lines; and the third group could be the most effective because they have the imagination and are plastics people to begin with. But to get anywhere at all in this construction field, a wide gap

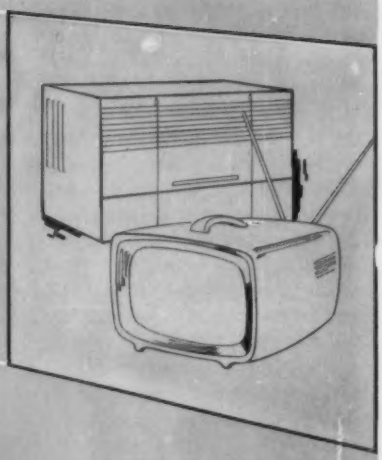
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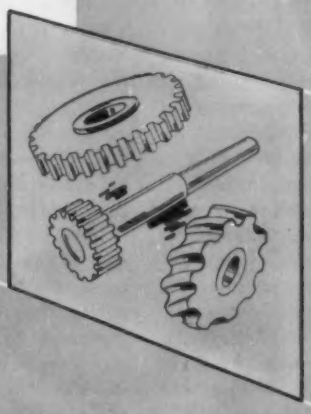
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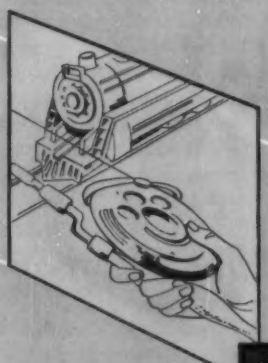
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The Plastiscope

needs bridging in *supplying information to the engineer in terms understood by him.*

That last statement was emphasized in many ways during various talks at the meeting. Perhaps the most emphatic demonstration of why the customer needs to be educated by the plastics industry was illustrated by the editor of a retail magazine who gave the audience a chance to listen to the playback of a television interview in which four housewives told why they bought plastics products: not a single one of them could give the generic name of any one plastic and one naively said, "I once bought some plastic glue." "Why?" asked the interrogator. "To fix some busted plastic toys," said the lady.

That little interview on plastics is a sermon in itself. A few booklets, a few television shows, an advertising campaign, are not enough. The general public still doesn't know much about plastics. And, incidentally, the S.P.I. budget for public relations calls for an expenditure of only $12,000, exclusive of salaries.

New vinyl processes easily

Results of long years of research by the older members of the vinyl chloride industry in developing new vinyl resins are beginning to show up. Goodyear's new Pliovic S50, described below, is probably only the beginning of new formulations that will soon start rolling out of polymer plants in a continuous stream. Development of this new resin is confirmation of the oft repeated assertion that anyone planning to enter the vinyl chloride production field must be prepared to spend endless years of research and millions of dollars just to keep abreast of competition in the field.

The new Goodyear Pliovic S50, an unmodified vinyl chloride resin, is particularly conspicuous because of its low viscosity which is 0.68 or about the same as vinyl copolymers. Viscosity of straight PVC resins is generally more than 1.00.

This low viscosity will permit processing of S50 into calendered sheeting as well as extruded and molded sections. According to Goodyear, there has never before been a straight PCV polymer with such low viscosity that could be processed at such low temperature so easily. Goodyear spokesmen also assert that the low temperature at which Pliovic S50 can be processed improves its heat stability to a degree slightly better than vinyl copolymers but not quite as good as other straight PVC resins. Thus, the end result is a straight PVC resin which, it is asserted, can be processed as easily as a vinyl copolymer but at a cost of 5¢ a lb. less for the resin.

If it is desirable to obtain a finished product that is a bit more flexible than conventional straight PVC sheeting (semi-rigid wall covering, for example), a small amount of plasticizer, say 5%, can be compounded with the vinyl. It is also possible to use small amounts of this new resin as a blending agent to aid the "processability" of higher molecular-weight resins that are used for flexible vinyl applications in the calendering and extrusion fields.

Some of the suggested uses for S50 are: blends with higher molecular-weight resins; vinyl-asbestos flooring; high fidelity phonograph records; injection molded items; rigid extrusions; semi-rigid calendered goods; and in vinyl-nitrile rubber compounds such as those used for impact pipe. It is believed that this new resin will find many new applications in fields where vinyl is not presently used. The price, as mentioned in Section 1 of The Plastiscope, is 27¢, which is the same as standard vinyl chloride resins.

The new Pliovic S50 follows close on the heels of Goodyear's recently announced Pliovic S70, which is a medium viscosity polyvinyl chloride intended for general-purpose applications, particularly for calendering clear film and sheeting. It broadened Goodyear's line of vinyl resins and helps serve segments of the industry not previously covered by a Goodyear resin. It can be processed at temperatures that would be marginal or impossible for higher molecular-weight resins and thus offers an opportunity for "tempering" high modulus stocks. When thus used as a blending resin, it extends the utility of equipment, permitting the production of a greater variety of vinyl products. In addition to use for calendering, it is also suggested for critical molding applications because of its good flow characteristics.

Coatings for Mylar

Du Pont's Mylar polyester film is now available with special coatings which are expected to permit wider application of this film for bags, overwraps, and vacuum packaging, according to an announcement by the company. However, until commercial production gets under way later this year at Du Pont's Circleville, Ohio, plant, only limited quantities of polymer-coated Mylar will be available.

Tests show that coated Mylar can be heat sealed successfully on standard high-speed automatic packaging machinery with minor modifications. At present, uncoated Mylar is sealed with adhesives or with a combination of heat and a solvent.

In addition to heat sealability, increased impermeability to moisture and gases is provided by coated Mylar. Commercial tests of candy and cookie packages have proved successful. Manufacturers of hardware and jewelry products recently have adopted coated Mylar to minimize breakage problems.

Vinyl stearate in commercial quantities

Air Reduction Chemical Co. will have its vinyl stearate plant at Calvert City, Ky., in operation by the end of this year. Polyvinyl stearate, a hard synthetic wax, will also be produced there.

Vinyl stearate-vinyl acetate copolymers can be used for exterior emulsion paints, according

to the company. Their high water resistance makes them helpful in adhesives, paper coatings, and textile finishes. When vinyl stearate is copolymerized with vinyl chloride, the resulting plastic, which is internally plasticized by the stearate, does not bleed and is suggested for food packaging and fabric and electrical coatings. Copolymers with a lower percentage of stearate are more rigid and are suggested for tubes, pipes, and other extruded forms, as well as for floor coverings and phonograph records.

More vinyl chloride

Plans for the construction of a 50-million lb. vinyl chloride monomer facility at its Deer Park plant, Houston, Texas, have been announced by Diamond Alkali Co. The plant will be designed and engineered by Scientific Design Co., Inc., New York, N. Y., and built by Brown & Root, Inc., Houston.

Scheduled for completion early in 1958, the new plant is part of a program which includes manufacturing facilities to produce acetylene from natural gas.

Boilable pouches to get boost

Among the new market areas which are expected to expand with the commercial availability of high-density polyethylene film is the field of boilable food packaging.

When Mylar-polyethylene laminate bags were introduced last year as pouches in which frozen and fresh food products could be cooked or heated without being removed from their wrapping (see MODERN PLASTICS *34*, 136, October 1956), they were hailed as harbingers of vastly increased frozen food sales; and they did indeed result in some increase. But the limiting snag was price. Mylar film sells around $2.30 a lb., and while it is used only in ½-mil gage, it adds significantly to the cost of the package; a further cost factor is the laminating process.

Materials suppliers and film makers feel that high-density polyethylene will break this price barrier and open up the whole realm of popularly priced frozen foods to the boilable-package maker. Since high-density polyethylene film does not soften at the temperature of boiling water, boilable bags can be fabricated of that film alone, without need for lamination to polyester film. Both the lower price of the film (high-density polyethylene is around 47¢ a lb.) and the elimination of the lamination operation will help to lower the price of the bags.

A question of gage. The gage generally considered suitable for this application is 2 mils, with an anticipated price range of from 0.6 to 0.9¢ per sq. foot. (This price is for 2-mil extruded tubing, which is likely to be the material from which the bags will be fabricated.) Gage estimates go up to 3 mils for packages for liquids, with a price of 1½¢ a sq. ft. for the 3-mil material.

At the present time no production quantities of high-density polyethylene film or tubing have gone into this application and the size of the market is, of course, only conjectural. One materials supplier estimates that 2 million lb. a year will be used for this application shortly after the availability of the film. Other guesses range from a conservative ½ million to an extravagant 10. The feasibility of such bags was illustrated at the recent Packaging Show when, at the booth of one material supplier, shrimp was boiled in H-D polyethylene pouches for distribution to visitors.

Lab program announced

Two courses of interest to industrial scientists in the plastics field will be offered this summer by Polytechnic Institute of Brooklyn.

"New Polymerization Techniques of Stereospecific Polymers" will investigate the use of the Ziegler-Natta catalyst system, comparing it with homogeneous ionic systems. Catalysts will be prepared in the lab and the mechanisms of catalysis covered; stress-cracking of the new polymers will be considered. Use of alkali metals, heavy metal salts, heavy metal oxides, free metals, etc., as catalysts for olefin polymerization will also be included.

A full course will be offered in the weeks of June 3 to 7, 10 to 14, and 17 to 21. Lectures pertaining to lab work will be given during the day; general lectures will be presented in the evening. General lectures are part of the full course but can be subscribed to separately. Fee for the full course is $150, for evening lectures $75.

"Application of Ion Exchange Resins and Membranes" is a course designed to meet the needs of chemists and engineers who wish to *use* ion exchange in practical problems. Both lectures and lab work will be provided. The course will be conducted Mondays through Fridays, July 8 to August 12. Fee: $150.

Attendance is limited. Inquiries should be directed to Mrs. Doris Cattell, Summer Laboratory Program, Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y.

To build chemical plants

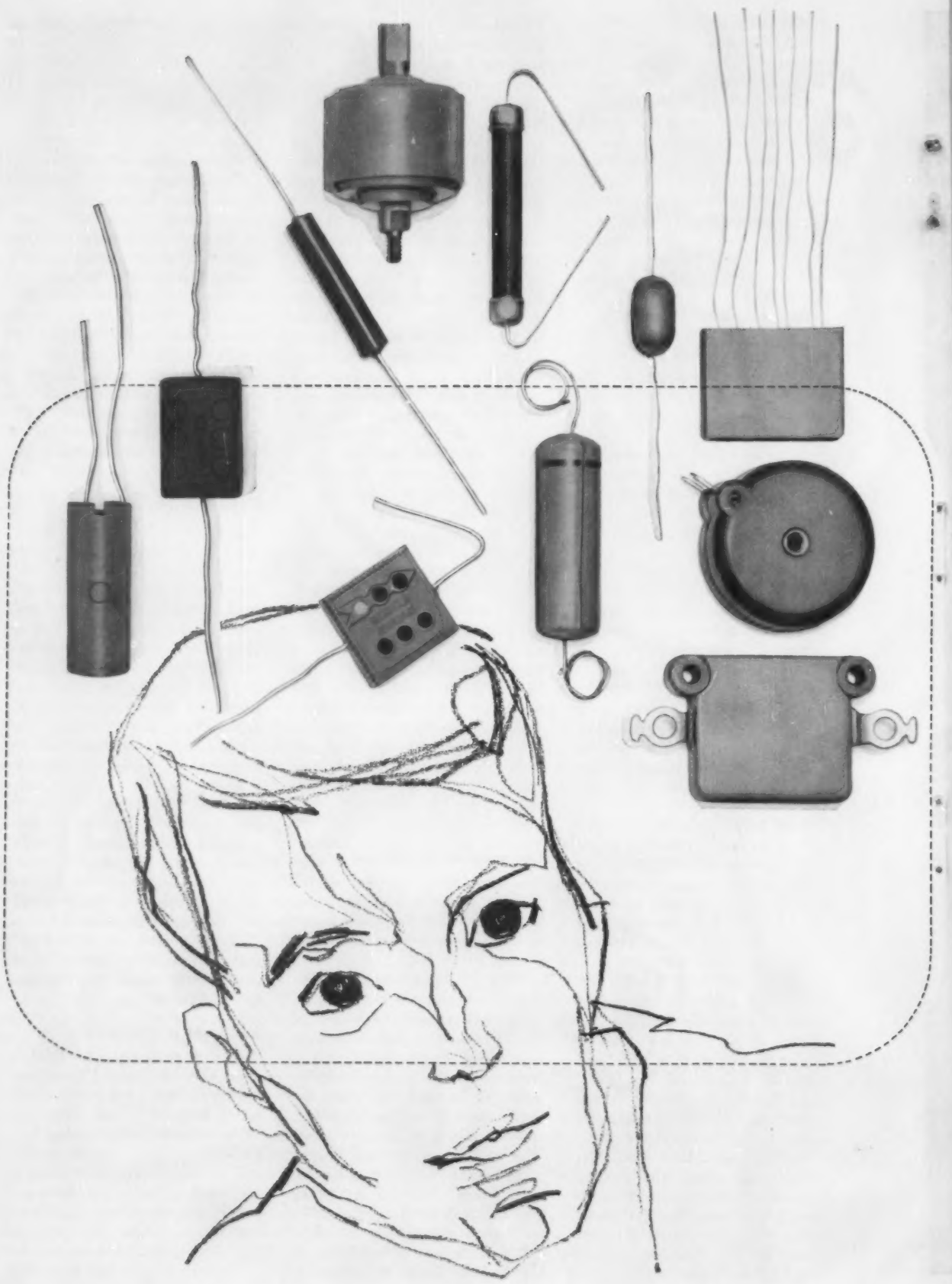
Formation of Davidson-Kennedy Associates, which will act as an engineering-contractor and will carry out the design, procurement of equipment and materials, and erection of chemical process plants and facilities, has been announced by Davidson-Kennedy Co., Atlanta, Ga., manufacturing firm. The new firm will furnish engineering, plant design, and construction; equipment will be furnished by the parent company and other suppliers on a bid basis.

Offices will be maintained in Atlanta and Chicago, Ill. Thornton Kennedy, president of Davidson-Kennedy Co., is also president of the new firm. The Chicago office is headed by Rex Wingard, former project engineer of Blaw-Knox Co.'s Fats and Oils Dept., and James Iliff, former chief process engineer of the Chemical Div. of Blaw-Knox.

Advances in vinyl-metal

Two new processes which, it is claimed, will expand the versatility and product uses of vinyl-metal laminates have been developed by Arvin Industries, Inc., Columbus, Ind.: 1) Equipment and methods have been devised for welding such laminates to metals of much heavier gage than themselves. Using this process, the vinyl-metal laminate can be

(*To page* 302)



TREMENDOUS PRODUCTION SAVINGS OF AUTOMATION COME TO TV SET ASSEMBLY THANKS TO PLASKON® ALKYD

PLASKON ALKYD PUTTY MATERIAL FOR ENCASED COMPONENTS MAKES POSSIBLE FULLY AUTOMATIC FINAL ASSEMBLY!

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Allied Chemical



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welded to heavy brackets, framework, and metal sheets. Previously, the laminate could be welded to metal only 1 gage heavier than itself or to the same or lighter-gage material. 2) Techniques have been perfected that make it possible to apply vinyl to both sides of a metal sheet for application in cases, luggage, and toys where a protective and decorative finish is needed on each surface.

Name patent vinyl

Tolex Patenel is the registered tradename adopted for Tolex vinyl patent manufactured by Textileather Div., The General Tire & Rubber Co., Toledo, Ohio. The material is expected to find usage in shoe uppers, handbags, and flat goods. It is presently offered in black, basque red, town brown, and smoked pearl. Special customer color requirements will be matched in regular production runs.

Patenel is available in either sateen or sheeting base in 54-in. widths.

Black polyethylene for weather resistance

Alathon 5F polyethylene, a new high-quality black formulation, has been introduced commercially by Du Pont as a film and paper-coating resin for applications where resistance to outdoor weathering is important. Products extruded from this material are said to be free of pinholes and surface defects. Complete dispersion of the carbon black in film made from Alathon 5F insures greater protection against degradation caused by sunlight.

Alathon 5F, a medium-density material, is intermediate also in its stiffness, toughness, yield strength, permeability, etc. The dispersion of carbon black in the resin is comparable to that found in the best black film used in electrical applications. Melt index is well within the range commonly found in film and paper-coating resins. It is easily extrudable, non-toxic, and virtually tasteless and odorless.

In solar stills. Perhaps the most dramatic application for Alathon 5F to date is in the experimental solar distillation unit (see p. 266) designed by Du Pont in conjunction with a program conducted by the U. S. Department of Interior to utilize the sun's energy in converting salt water to fresh water. In most climates, life expectancy of film made from the new black resin is from two to four years.

Other suggested applications for the new polyethylene formulation are conveying and storage of irrigation water; protection of harvested crops, mechanical equipment, and construction materials from weather; ground mulches for pineapples, strawberries, beans, and tomatoes; vapor barriers to retard the evaporation of water during the curing of concrete; light barriers for use in packaging sensitive materials; water-resistant construction papers; and gas barriers in soil fumigation.

A distinctive tag, supplied by Du Pont to qualified extruders, will be attached to film made from Alathon 5F polyethylene resin to enable customers to easily identify this quality material. Price for the material is 37½¢/lb. in truckload quantities.

Sandwiches at M.I.T.

A two-week special summer program on structural sandwich design will be offered by M.I.T., starting July 8. The course will explore the use of the sandwich concept in architectural applications. Properties of the various materials which can be used in structural sandwiches will be examined; methods of fabrication and their relation to performance of the sandwich will be studied. The manner in which sandwiches sustain loads and the stresses so created will be developed from theoretical considerations and demonstrated by laboratory tests. A variety of existing structural sandwiches will be examined. The important aspect of installation details, including joining and sealing techniques, will also be treated.

In contrast to previous special summer programs in the field of plastics in building, this program will be largely devoted to lectures, laboratory demonstrations, and discussions, with lessened emphasis upon specific student design problems. The program is being jointly presented by the Department of Architecture and the course in Building Engineering and Construction of the Department of Civil and Sanitary Engineering. Lectures will come from the M.I.T. faculty and various companies active in this field, including aircraft manufacturers.

The program, 4.319, Structural Sandwich Design, will run from Monday, July 8, through Friday, July 19. Tuition is $250. Inquiries regarding registration should be sent to J. M. Austin, Director of the Summer Session, Massachusetts Institute of Technology, Cambridge 39, Mass.

New molder

The Weber Lifelike Fly Co., manufacturer of fishing tackle, has expanded its operation into the plastics field with the organization of a wholly-owned subsidiary, Weber Plastics, Inc., which will be housed in the parent company's building at Stevens Point, Wis.

At the present time, the company will specialize on molding expandable polystyrene and vinyl plastisols. Among products planned or in production are floats for minnow buckets; plastic bodies for fly and spinning poppers and other fishing lures; duck decoys; Christmas tree ornaments; fish net floats; artificial worms, and other items. Ultimately, the firm plans to do custom molding.

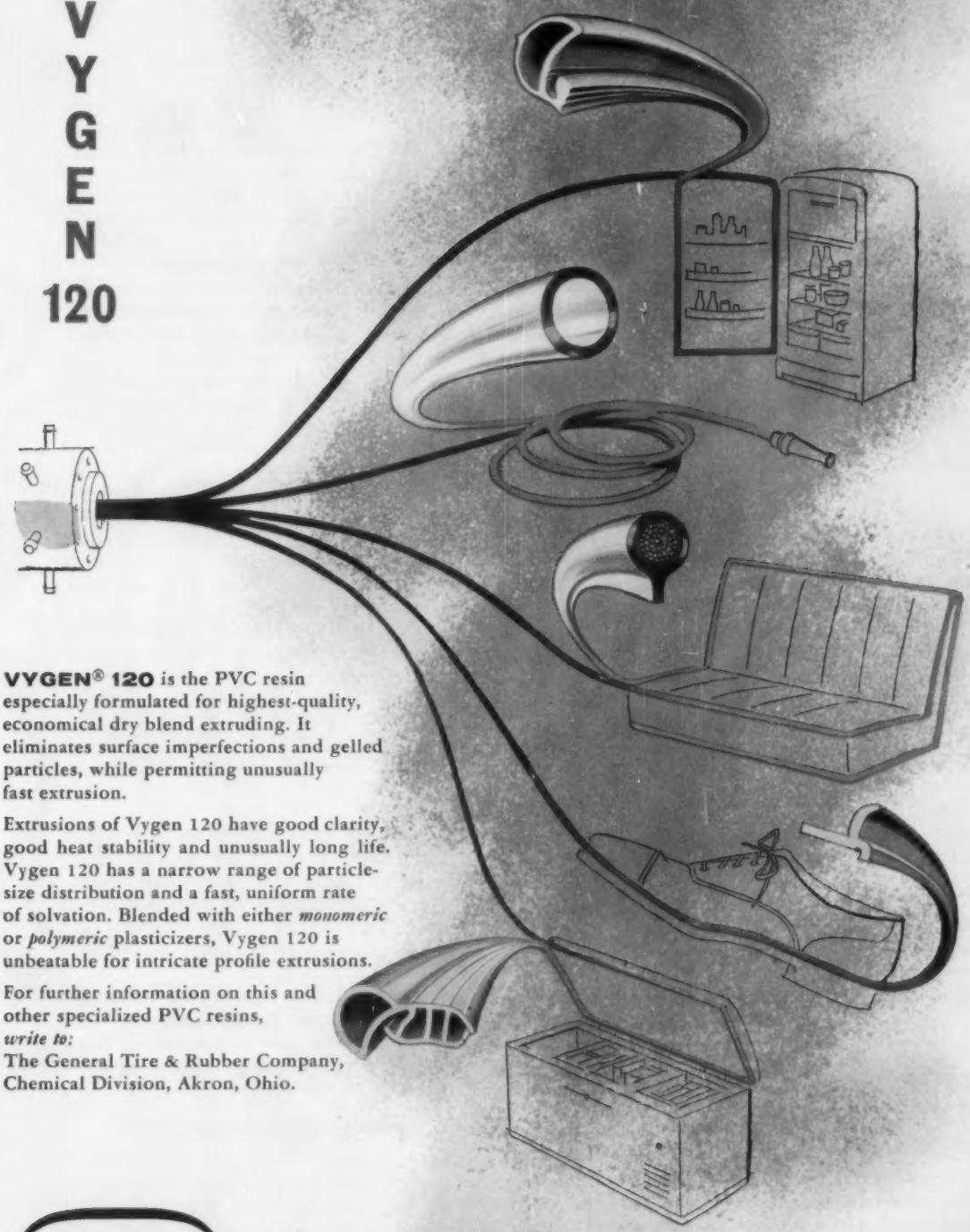
E. C. Wotruba, Sr. is president.

Local S.P.I. Chapter formed

The New York Metropolitan Chapter of The Society of the Plastics Industry, Inc. held its first meeting recently, at which Zenn Kaufman, sales consultant,

for economical dry blend extruding

VYGEN 120



VYGEN® 120 is the PVC resin especially formulated for highest-quality, economical dry blend extruding. It eliminates surface imperfections and gelled particles, while permitting unusually fast extrusion.

Extrusions of Vygen 120 have good clarity, good heat stability and unusually long life. Vygen 120 has a narrow range of particle-size distribution and a fast, uniform rate of solvation. Blended with either *monomeric* or *polymeric* plasticizers, Vygen 120 is unbeatable for intricate profile extrusions.

For further information on this and other specialized PVC resins, *write to:*
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spoke on "Dramatize Your Selling." The Chapter is a direct outgrowth of P.E.A. (Plastics Engineers Association) which was founded about 20 years ago by C. J. Groos, sales manager of Boonton Molding Co.

The Chapter plans to hold two to three meetings each year to which former members of P.E.A. as well as members of S.P.I. are invited. The meetings will be oriented toward sales and production personnel; although management will be occasionally represented, the Chapter will not be a management group. The next meeting is scheduled for November and will be held at the Yale Club in New York. Officers of the Chapter have not yet been elected.

Custom forms Mylar

Facilities for custom forming Mylar polyester film in thicknesses from ½ to 7½ mils have been announced by Sillcocks-Miller Co., Maplewood, N. J. Prime applications for the new forming techniques are electrical insulators and diaphragms now being produced for electronic parts manufacturers. Facilities for forming Mylar in the lower range of thicknesses has heretofore been very limited.

Color line expanded

Silk screen colors have been added to the line of spray colors and finishes produced by Sullivan Chemicals, Div. of Sullivan Varnish Co., Chicago, Ill. The company specializes in decal lacquers, vinyl and acetate screenings, and screening for butyrate, polystyrene, acrylics, etc.

Du Pont drops royalty

Firms licensed under Du Pont's isocyanate patents to make urethane foams and coatings will no longer be required to pay royalties under a new policy announced by the company's Elastomer Chemicals Dept. Royalties previously amounted to 1½% on the selling price of urethane products manufactured under Du Pont patents. Over 100 licensees are involved.

Company spokesmen state that the new royalty-free policy was adopted to stimulate and encourage the urethane foam industry.

New finishing service

Manufacturers Service, Inc., 220 Chico Ave., El Monte, Calif., has been formed to perform precision multi-barrel slidehone finishing of plastics and metal parts on a job basis. The new company is also marketing exclusive multi-barrel slidehoning machinery for B.M.T. Mfg. Corp. and Lakeseal Organ-Tu tumbling compounds for Finger Lakes Chemical Co. in the 11 western states, and distributing associated abrasives and barrel fiinishing supplies.

Alan J. Bronold is president of M.S.I.

The B.M.T. multi-barrel precision slidehoning machine employs a 48-in. revolving disk on which can be mounted as many as 25 barrels with a variable rotating speed from 11 to 28 RPM and with different sizes and shapes of barrels available, plus a range of mountings. The equipment makes possible a combination of rotary, centrifugal, and slidehoning actions all at one time.

Erosion licked?

A report from Alsynite Co. of America, San Diego, Calif., states that its Chemiglazed fibrous glass-reinforced plastics panels have better weathering resistance than equivalent untreated panels. The report is based on tests recently conducted by United States Testing Co., Los Angeles, in accordance with ASTM D822.

Erosion is usually caused by glass fiber bundles on the panel surface absorbing moisture, expanding on temperature change, and causing a microscopic but progressive breakdown of the resin surface of the panel. Chemiglazing is claimed to prevent such erosion by insuring that all fiber bundles are thoroughly saturated with resin and none lie on the panel surface.

Bigelow sells

Fiber Glass Industries, Inc., a newly formed company, has purchased the fibrous glass and reinforced plastics operations of Bigelow-Sanford Carpet Co., Inc., Amsterdam, N. Y. The new organization has no connection with Bigelow-Sanford. In the transaction, Fiber Glass has obtained the machinery, equipment, and inventory of the two operations and has assumed obligation to meet delivery promises for current orders.

Both operations are conducted on leased property that formerly was owned by Bigelow-Sanford. The fibrous glass operation manufactures woven fibrous glass cloth and mechanically bonded mats for use in the reinforced plastics industry. The reinforced plastics operation fabricates specialized products for industrial and military applications.

Ara T. Dildilian, formerly general manager of the fibrous glass and reinforced plastics activities at Bigelow-Sanford, is president; Roger B. Knowles, formerly manager of Bigelow-Sanford's Reinforced Plastics Div., is vice president.

Some epoxies down

Drum prices for Epon 562 and Eponite 100 epoxy resins, produced by Shell Chemical Corp., 50 W. 50th St., New York, N. Y., have been reduced from $1.55/lb. to $1.15/pound.

Eponite 100 is used in textile coatings. Epon 562, introduced in 1950, is used as a structural resin in adhesive, casting, and laminating compositions.

Dentures improved

Shortcomings of all-porcelain and and all-plastic dentures are overcome by a new technique which combines porcelain upper and plastic lower posterior artificial teeth. Developed by Myerson Tooth Corp., Cambridge, Mass., this combination is said to make available the advantages of both materials while eliminating their



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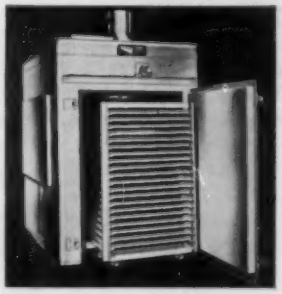


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MOCO has learned this lesson well—as have some other oven manufacturers. But, just in case, may we have the opportunity to show you a few facts about plastic processing—and how to most efficiently produce *your* particular product. It may be helpful.

YOU'LL WANT THESE BASIC OVEN FACTS IF YOU DO ANY OF THESE OPERATIONS...



MOLDING • FABRICATING • EXTRUDING • COATING • LAMINATING • RECLAIMING • MATERIAL PRODUCTION • RE-INFORCEMENT

This Fact Book by MOCO engineers on the basic operating principles of heat processing ovens should prove interesting. If you have specific questions, please write.

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weak points. For example, traumatic shock associated with porcelain teeth is overcome, being absorbed by the softer plastic; clicks disappear; wear occurring when both uppers and lowers are plastics is reduced to about one tenth.

The plastic teeth are made of a cross-linked copolymer of which methyl methacrylate is the principal component. The special molding process used involves mixing monomer and polymer to form a dough which is packed in metal molds. Polymerization is completed in the mold. This development has been accepted for advertising in the *ADA Journal*.

Shell-Kleemann

Shell Chemical Co. Ltd. and O. & M. Kleemann Ltd. have entered into an agreement whereby Kleemann or its subsidiaries will have certain plastics raw materials manufactured by Shell or its associates which will be marketed under the tradename of O. & M. Kleemann Ltd.

Under this arrangement, Kleestron Ltd., a subsidiary of O. & M. Kleemann Ltd., will have its polystyrene manufactured at the Partington plant of Styrene Products Ltd., an associate of Shell Chemical Co. Ltd.

Kleestron will continue to operate as an independent organization, marketing its own products in the same manner as it has done since the firm began production of polystyrene in 1951, and its selling arrangements and policies both at home and abroad will be maintained.

They like polyethylene

A research study conducted for Du Pont's Polychemicals Dept. by Alfred Politz Research, Inc. brings to light some interesting facts concerning consumers' attitudes about the use of polyethylene for dry-cleaning garment bags. Over 85% of the people sampled said they would prefer polyethylene bags over traditionally used wrapping materials; over 50% would switch to a cleaning establishment using polyethylene bags, even at an increased cost of 5¢ per garment cleaned.

These impressive figures go far to support the estimate that polyethylene film is being used for this application at a current rate of over 5 million lb. a year and is growing rapidly.

Widens urea usage

A fortifier for conventional urea resin liquid wood adhesive has been developed by Borden Co.'s Chemical Div., 350 Madison Ave., New York, N. Y. Designated Modifier MO-614-L, it is said to be particularly suited for "moderate" exterior applications—protected doors, furniture, and other glued woods exposed to high heat and humidity.

The product is described by Borden as moldproof, light in color, and capable of withstanding a 3-hr. water boil test. The mix can be cured at room or intermediate temperatures.

Big business in housewares

Housewares business for 1957 looks at least as good as at the 1956 year-end, according to Dolph Zapfel, secretary of the National Housewares Manufacturers Association, as he reported that more than 620 exhibitors (a new record) will be at the 27th NHMA Housewares Exhibit in the Atlantic City Auditorium from July 8 to 12.

Manufacturers of housewares voted 40 to 1 in an NHMA December survey that 1957 business would go up instead of down. More than 92% of buyers who replied agreed that business would go up for three basic reasons: better merchandising, continued improvement in general business trends, and better housewares items.

Mr. Zapfel refused to estimate probable buyer attendance at the 1957 NHMA Atlantic City Exhibit, except to say that the business outlook should provide a record buying crowd. Almost 7500 buyers registered at the 1956 summer show.

Real metallic colors in extrusion

Extrusions said to have a true metallic appearance have been developed by Schwab Plastics Corp., 730 S. Dix Ave., Detroit, Mich. Gold, brass, silver, chrome, and annodized aluminum colors are achieved by extruding a variety of clear and tinted translucent plastics over metallic core materials.

Designated Spectro-Chrome, the extrusions are available in flexible spirals or straight form. Applications include cord coverings, handles, fashion accessories, jewelry, book bindings, trim, and many uses in the electrical and electronic fields.

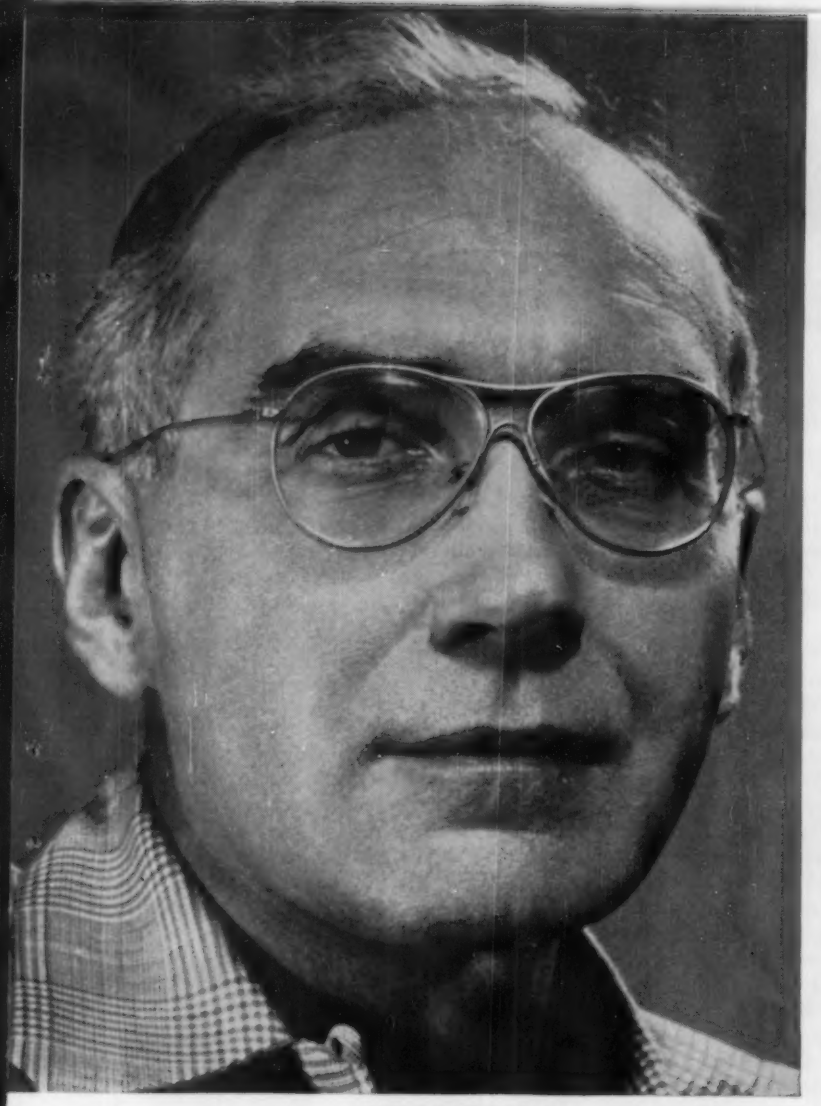
Union Carbide buys Elastomer

Purchase of the patents and experimental equipment of Elastomer Chemical Corp. has been announced by Union Carbide Corp. Elastomer was the owner of a process for manufacturing mechanically blown vinyl chloride foam, but production of such foam is entirely in the hands of its licensees. Numerous foreign and domestic licenses have been granted under the Elastomer patents. Union Carbide proposes to offer additional licenses and make its own technical developments in foam production available to licensees.

More polyether-based foam

An improved polyether-based resin and catalyst system to produce low-density flexible polyurethane foams has been developed by Chase Chemical Corp., 3527 Smallman St., Pittsburgh, Pa. The system produces foams that set and are tack-free 5 min. after pouring, and cure in 10 min. without the use of heat or pressure.

The company states that both its new resin and catalyst are stable and have good shelf life and can be used without modification as shipped. After metering and mixing, application can be done by pouring or spraying. Foams produced by this system are said



RUSSEL WRIGHT, F.A.S.I.D., New York, looks into the future.



The sleek good looks and complete practicality of this man's disposable talcum box were made possible with high-impact Styron. Top swivels one full turn to expose opening.

Styron is first choice of molders for accurate, authentic duplication of the real thing in popular hobby model applications. This box car is less than six inches long!



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"The industrial designer's main function," Mr. Wright says, "is . . . to sell the consumer . . . on what the manufacturer can produce."

Because of its many formulations (11, to be exact), Styron meets the requirements of more applications—for more sales. Because Dow continually introduces improvements in both materials and methods, Styron is your first choice for advanced design—to create more sales. And because Dow offers invaluable services for solving particular problems, Styron has an exceptional record for problem-free applications—for more sales.

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- STYRON 777 (Medium Impact)
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HEAT RESISTANT

- STYRON 683
- STYRON 700

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to develop good skins when foamed, to be fire resistant, resistant to petroleum and coal tar solvents, and capable of being slit in thin sections and sewn. According to Chase, they have physical characteristics approaching that of foam rubber.

Suggested applications include cushioning for furniture and airplane seating; shock absorbing padding for automobile crash pads; athletic equipment; insulation for lining winter clothing; inner and outer shoe soles; chemical-, rot-, and vermin-resistant sponges and mops; flexible toys; padding for rug and ironing board cover underlays; clothes hangers; shoulder pads; etc.

New fabricator

Formation of National Fiberglass Corp., Gilroy, Calif., has been announced by K. I. Marts and J. E. Hermann. The company will initially manufacture and distribute one-piece polyester-fibrous glass stall showers and Pullman-type lavatories.

Bigger laminate sheets

High-pressure laminated sheets in 36- by 72-in. size are now available from Synthane Corp., Oaks, Pa. Previous size available was 36- by 36-in. sheet. The larger sheets have been made possible through the installation of a new 10-opening hydraulic platen press designed and built by Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. The new press has also increased Synthane's sheet capacity, so far as pressing is concerned, by approximately 40 percent.

Industrial lenses

Lightweight lenses, produced by optical methods from Plexiglas R methacrylate sheets (rather than by molding) and suggested for a variety of industrial applications are now available from Optics Mfg. Corp., Philadelphia, Pa. Among the advantages claimed for the lenses are the following: they are non-breakable in normal usage, easily mounted, adaptable to various manufacturing methods, and machinable to most any shape; the firm offers spherical shapes and their combinations in all standard sizes. Lenses can also be ground to individual specifications.

Typical applications include Fresnel lenses, lenticular screens, viewers, magnifiers, reducers, image displacers, and others.

Magnets aid processing

Inclusion of non-electromagnetic separators in the processing line of Durez Plastics Div., Hooker Electrochemical Co., has resulted in elimination of fire and explosion hazards due to sparks generated by stray bits of ferrous metal and the assurance that the finished product is free of ferrous contaminants, according to a report by Eriez Mfg. Co., Erie, Pa., maker of the equipment. Durez installed one series of separators ahead of its blending, mixing, grinding, and rolling equipment and another as the final piece of equipment at each pack-out line.

Epoxy-glass insulation

Red, semi-cured, treated fabric and tape made from continuous filament glass fabric, coated with a semi-curing epoxy resin on one side, are available from Westinghouse Electric Corp., Micarta Div., for electrical insulating applications. The material is said to have good mechanical characteristics, moisture resistance, and electrical properties.

Westinghouse recommends the tape for use as layer insulation where bonding between adjacent layers of coil build-up is required, in transformer coils, edge-wound coils, field coils, and similar applications requiring insulation in the Class B range.

As in conventional insulations, the material is slit into tapes of specified widths and wrapped half-lapped over the coil or part to be insulated. Bonding is achieved with a pressing cycle involving the use of pressures of 100 to 150 p.s.i., a temperature of 135° to 150° C. for 30 min., and an after-bake period of 6 to 8 hours. The resulting cured void-free insulation exhibits a dielectric strength of 400 v./mil.

Resin resists HF at 240° F.

A graphite-filled epoxy resin, specially designed to resist the corrosive effects of hydrofluoric acid, has been announced by Haveg Industries, Inc., Wilmington, Del. Containers made of this material will also handle fluorides, other fluorine salts, and chemical reactions between hydrofluoric acid and organic or inorganic compounds.

Designated Haveg 093, the resin is claimed to withstand all concentrations of HF at temperatures up to 240° F. in continuous operation. Higher temperatures are possible for short-time overloads. Parts already fabricated of this material include pipe, pump parts, valves, and tanks up to 10-ft. diameter.

Extruded polyethylene stock

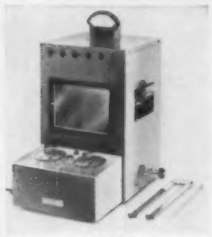
Rough shapes extruded of polyethylene for further processing into special forms by machining and welding are offered by Conneaut Rubber & Plastics Co., Conneaut, Ohio. The extrusions, available in a wide range of sizes, are produced from a variety of formulations, including compounds containing boron carbide for neutron absorption used in atomic energy applications.

Expansion

United States Gasket Co., Plastics Div. of The Garlock Packing Co., fabricator of fluorocarbon plastics (Du Pont's Teflon and Kellogg's Kel-F), is constructing a fabricating facility in Milan, Italy. The plant is being erected in cooperation with **Montecatini**, manufacturer of Algoflon fluorocarbon resin, and will be operated under the name of **Marengo S.P.A.**

The plant, using United States Gasket technical "know-how," will fabricate sheets from Montecatini fluorocarbon resin up to 36 by 36 in. in size and extrude rods and tubing in all standard com-

FLAMMABILITY-IGNITION



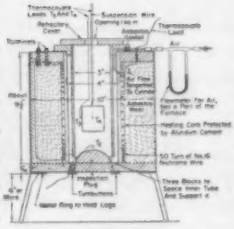
Model CS-19

FLAMMABILITY

The SPI Flammability Tester for measuring relative flammability hazard of various sheet materials. Ref: Com. Std. 192-53—ASTM Designation D1433-52T

IGNITION OF SOLIDS

The Setchkin Self-Ignition Apparatus for Solids provides a unit for determining ignition characteristics of materials. Ref.—"Proposed Method of Test for Defining Non-combustibility of Building Materials" ASTM Bul. Feb. 1957, page 33.

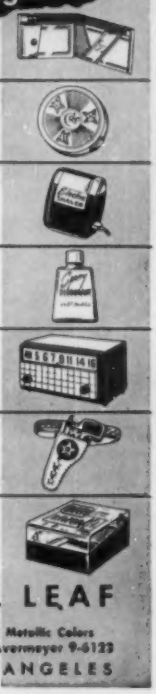


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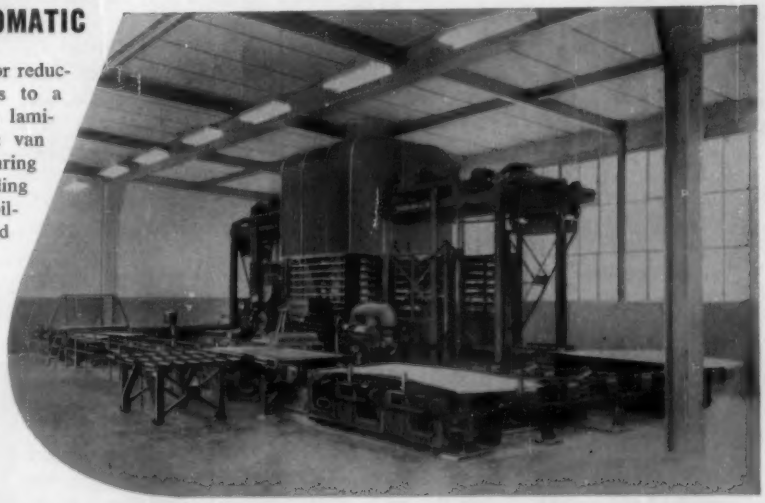
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The Plastiscope

mercial sizes. In addition, facilities for custom molding and machining parts from Algoflon will be available to European industry.

The Borden Co. has opened its second southern formaldehyde and resins plant at Fayetteville, N. C. Geared to produce 36 million lb. of formaldehyde annually, the automated plant employs 25 workers. The facility will also make urea resins from its formaldehyde production and will serve as a warehouse for polyvinyl acetate and polyvinyl alcohol, serving the textile, paint, and adhesives industries.

This is Borden's fifth formaldehyde plant; it boosts the company's aggregate formaldehyde production to 12% of total domestic consumption.

Naugatuck Chemical Div., United States Rubber Co., announces the completion of one expansion program and the start of another. Cost of the two programs will total more than $9 million.

Production of Paracril, butadiene-acrylonitrile copolymer synthetic rubber, has been increased 60% at the division's Baton Rouge, La., plant at a cost of approximately $2 million. Work has been started on a new chemical plant on a 150-acre site in the Scotts Bluff area of Baton Rouge for the production of Kralastic. The new facility, to be built at a cost of $7 million and scheduled for completion by the end of the year, will triple Naugatuck's production capacity for Kralastic; it will also provide capacity to make more than 60 million lb. of plastics and synthetic rubber yearly in Baton Rouge.

J. Scott Brown, factory manager of the present Baton Rouge plant, will also manage the new facility.

B. F. Goodrich Chemical Co. has started construction of a $5 million chemicals plant near Henry, Ill., for the production of specialty organic chemicals, such as antioxidants, for use in the plastics, petroleum, rubber, and other industries. It will call for about 80 employees. The plant is expected to be completed early in 1958.

Escambia Chemical Corp. has started construction of a 50,000-sq. ft. Research Center at Wilton, Conn. The facility will provide for research and development activities and customer and technical service laboratories, specifically in petrochemicals, in the plastics industry, and in related fields.

Since Escambia Chemical was organized in 1954, it has conducted its own research and technical service activities at facilities in Cambridge and Newton, Mass., owned by **National Research Corp.,** and will continue there until Escambia occupies its new Center early in 1958.

Dr. Nat C. Robertson, vice president and director of research, will be in charge of the Center. **Robert G. Reed** will be business manager.

Minnesota Rubber & Gasket Co. has acquired the assets of **General Industrial Products Co., Inc.** and will operate the firm as a division of Minnesota Rubber. The new division, to be known as **Minnesota Latex Rubber Co.,** will include the original company's two plants in Minneapolis. The firm specializes in the Kotokast process for producing low-cost plastic and rubber industrial and commercial products. It also makes sprayed, dipped, and formed rubber parts.

Walter Craig, president of General Industrial Products, will continue to direct operations as general manager of the new division.

Wyandotte Chemicals Corp. announces construction of a large-capacity plant at Wyandotte, Mich., for the output of newly developed products. To be known as the oxide products plant, the facility will be a multi-purpose plant capable of increasing output of Pluronic and Tetronic polyols. These polyethers are widely used in nonionic surfactants and as intermediates in the polyurethane foam plastics market. Completion is scheduled for late this year.

Irwin A. Davis of the Engineering and Design Dept. will be project engineer.

The Polymer Corp., Reading, Pa., has established a plant at 3030 Oak St., Santa Ana, Calif., to perform custom coating by the new Whirlclad fluidized bed coating process. (For details on this process, see p. 242 of this issue.) The process is based on inventions of **Knapsack-Griesheim,** a division of **Farbwerke-Hoechst,** Germany.

The Polymer Corp. will operate in Santa Ana under a license from **Polymer Processes, Inc.,** which states that it has exclusive United States patent and licensing rights to the fluidized bed technique.

Union Carbide Chemicals Co., a Div. of Union Carbide Corp., announces that acrylonitrile production will be doubled by the second quarter of 1958 at its Institute, W. Va., plant.

Monsanto Chemical Co. has started an expansion of the capacity of its acrylonitrile plant at Texas City, Texas, which will increase the company's annual output to more than 100 million pounds.

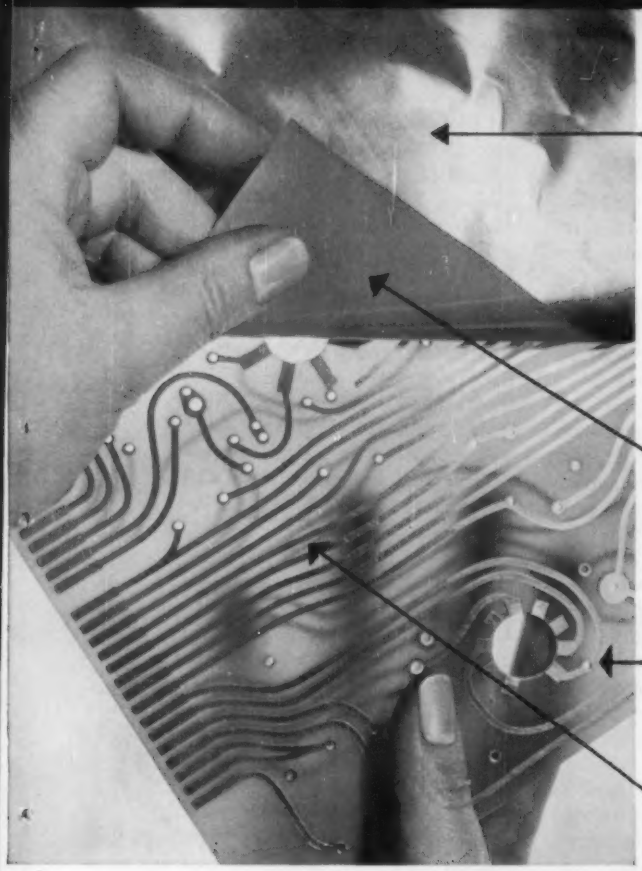
Reeves Brothers, Inc., 54 Worth St., New York, N. Y., has purchased the **Fairmont Mills** plant in Spartanburg County, S.C., and is transferring the operations of the **Warrior Duck Mill** from the present location in Fairforest to the new and larger plant.

The Warrior Duck Mill is a division of **Reeves Brothers Plastics, Inc.** and is engaged in the extrusion and processing of polyethylene filaments.

Imco Container Corp., Kansas City, Mo., manufacturer of polyethylene bottles, has opened a plant in Canada to serve the Canadian affiliates of its American customers. The Canadian firm,

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Printed circuits such as this start with a sheet of electrolytically deposited copper of 99.5% purity (generally .00135" or .00270" thick). This is coated on one side with . . .

Plymaster Type "C" a specially formulated Araldite Epoxy-based adhesive which features high resistivity and other electrical insulating characteristics comparable to those of the baseboard. This "PLYMASTER" adhesive-coated copper is then bonded to . . .

An epoxy-impregnated fiberglas baseboard which incorporates excellent electrical characteristics . . .

Excess copper is then etched away, leaving a "printed" electrical circuit on one or both sides of the epoxy "board" . . .

Highest grade circuits for use under extreme service conditions, are then plated on top of the copper with a more oxidation-resistant metal (silver or gold). Although these plating baths contain cyanides, new PLYMASTER TYPE "C", utilizing an adhesive based upon Araldite Epoxy Resins, shows no decrease in bond strength even under severest plating conditions.

Drastically reduced costs . . . lighter weight and compactness . . . higher uniformity in production and consistent reliability in service . . . all the "plus" features that favor printed circuit design for electrical and electronic assemblies come through where the bonding agent is Araldite Epoxy-based Plymaster® Type "C", a development of Rubber and Asbestos Corp.

The efficiency of any printed circuit is only as good as the ability of the adhesive to provide not only necessary bond strength but positive resistance to moisture absorption and with insulating characteristics comparable to the baseboard.

How well this newest Araldite Epoxy-based Adhesive tests out under actual production and service conditions is detailed in the picture-captions at the left.

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The Plastiscope

Imco Container Canada Ltd., will produce both stock and private-mold bottles. Fittings and closures will be available, as well as a silk screening and hot stamping service.

Consolidated Bottle Co. Ltd., Toronto, Ont., distributor of containers, closures, seals, etc., has been appointed exclusive Canadian distributor for Imco Container Canada Ltd.

Commercial Plastics & Supply Corp., 630 Broadway, New York, N. Y., has purchased the assets of **Plastic Center of New Jersey, Inc.** and has established a new warehouse at 170 Malvern St., Newark, N. J., supplying plastic sheets, rods, and tubes. **Allan Cohen** is manager.

Commercial distributes Plexiglas, acetate, vinyl, nylon, Teflon, and polystyrene. The firm also has branches in Miami, Pittsburgh, Ozone Park, N. Y., and Greensboro, N. C.

Endicott-Seymour, Ann Arbor, Mich., announces the acquisition of a 4000-sq. ft. warehouse. The firm specializes in injection molding and will use the additional space as a storage and shipping point for its proprietary lines: These include laboratory equipment, displays for china and dinnerware, and plastic letters for signs and displays.

Clear View Plastics Corp., Poplar Bluff, Mo., has added a vacuum metallizing operation to its injection molding and decorating facilities with the acquisition of **Mo-Vac Corp.**, Morganfield, Ky.

Roy B. West is president; **Allan S. Kothe**, chief engineer of Clear View, will manage the new **Mo-Vac Div.**

Morton-Withers Chemical Co., Greensboro, N. C., announces expansion and reorganization of its technical sales service facilities. A new sales service and development laboratory is being constructed to render development and testing service on Morton-Withers' Morflex plasticizers and Morester polyesters. The firm will also specialize in synthesized petroleum sulfonates for the production of which a new plant is presently underway at Greensboro, with a second and larger unit being projected for erection in the Baton Rouge, La., area during 1957-58. **Robert E. Lally**, formerly with Ferro Chemical Co., has been appointed to direct the new service.

The company is also working on plans to expand its facilities for the production of polyester resins for polyurethane synthesis, polymeric plasticizers, and synthetic lubricants. This expansion is expected to triple present production.

Wabash Rubber & Plastics Corp., a subsidiary of **H. O. Canfield Co.**, Bridgeport, Conn., is adding 45,000 sq. ft. of production and warehouse space to its existing 15,000-sq. ft. plant at Seymour, Ind., which will more than double production.

The firm extrudes PVC gaskets for the refrigerator and related industries; it also does work with rubber, silicones, and other materials.

Chanal Plastics Corp., vacuum former and fabricator, has moved from 361 Stagg St., Brooklyn, N. Y., to its new 25,000-sq. ft. factory at 63-20 Austin St., Rego Park, N. Y. The company claims that its new vacuum forming plant is the largest in the United States. In addition to thermo-forming machines, it is equipped with engineering, mold-making, die-cutting, silk-screening, decorating, folding, assembly, and heat-sealing facilities.

Deceased

Elmer C. Maywald, 60, a Plastics Pioneer and manufacturers' representative and consultant in the plastics industry. He was formerly a vice president of Chicago Molded Products Corp. Mr. Maywald was instrumental in the formation of S.P.E. and had always been one of the active members of both that organization and S.P.I.

Charles Julian Romieux, 60, died in Brussels, Belgium, while on a business trip. At the time of his death he was executive vice president of **Capital Plastics**, Rochester, N. Y., which he had helped establish in 1955. Mr. Romieux was a Plastics Pioneer and one of the most widely known personages in the industry. Before going to Capital, he had been sales manager of the Plastics and Resins Div. of American Cyanamid Co. for many years, and was an influential figure in the widespread use and development of urea and melamine resins.



C. J. Romieux

Kenneth Robbins, 42, president of **Robbins Plastic Machinery Corp.**, Elkhart, Ind., was lost in an airplane accident recently. His body has not been recovered and he has now been legally declared as deceased. The Robbins company is a manufacturer of extrusion dies and equipment. Vincent W. La Pointe, named president to succeed Mr. Robbins, was associated with The International Detrola Corp. and Motor Products Corp. before he joined Robbins. L. Armstrong, now vice president of Robbins, is president of St. Joseph Valley Bank, which is guardian and trustee of the Robbins estate, and majority stockholder. Harrison Church, corporation attorney since the inception of the company, is secretary. Richard Bibler, assistant cashier at St. Joseph Valley Bank, has been appointed treasurer.



K. Robbins

Douglas Woodruff, 75, chairman of the board of **Auburn Button Works**, Auburn, N. Y. He was president of the company, which



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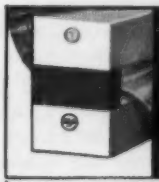


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Acheson Dispersed Pigments Co., Philadelphia, produces black polyethylene concentrate in granular form from which insulation compounds for electric cable and wire are made. To protect the purity of their products they use the RCA Metal Detector, thus preventing rejected shipments due to metallic contamination. Presence of metal in the insulation would render the cable useless. Metal particles in their products are also a clue to defective machinery. By analyzing the rejected materials they can go back to the machine and repair it before serious damage results.

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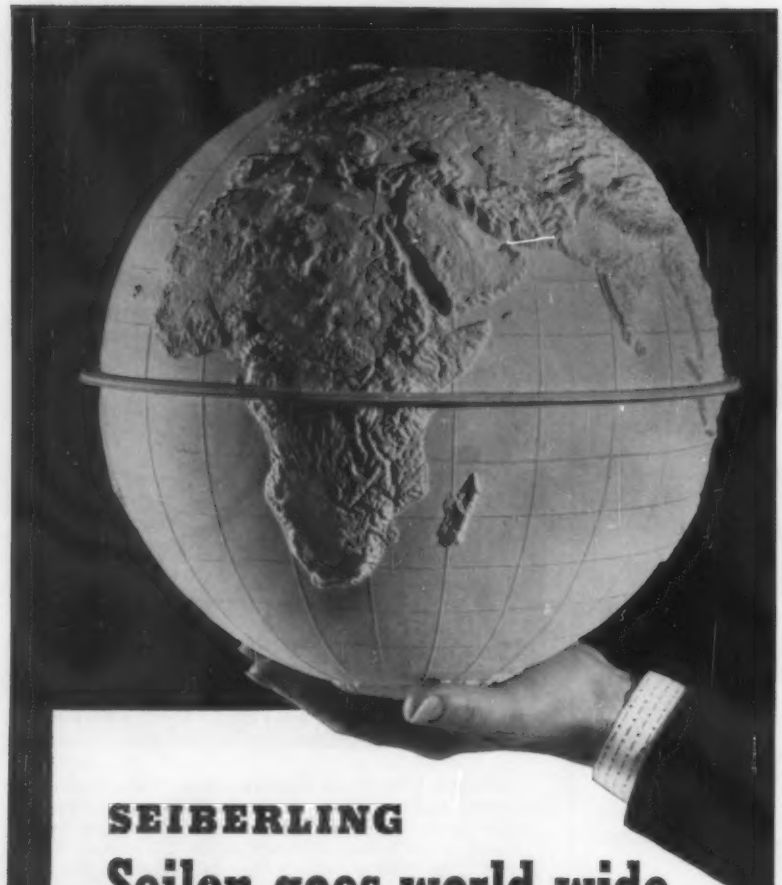
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Plastics Division

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was founded by his father in 1876, from 1927 to 1951, in which year he became chairman of the board.

Meetings

Plastics groups

June 13-14: The Society of the Plastics Industry, Inc., Midwest Section Conference, Arlington Hotel, Hot Springs, Ark.

June 14: Society of Plastics Engineers, Inc., Regional Technical Conference, Lowell Institute of Technology, Lowell, Mass. Subject: "Plastics for Electronics."

Other meetings

June 14: The Boston Rubber Group, Sponsored by Division of Rubber Chemistry, A.C.S., Annual Summer Outing, Andover Country Club, Andover, Mass.

June 16-21: American Society for Testing Materials, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

July 17-19: American Society of Testing Materials, Meeting of Committee D-20 on Plastics, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 30-July 3: Housewares Shows Corp., Second International Housewares Show, Coliseum, New York, N. Y.

July 8-12: National Housewares Manufacturers Association, Exhibit, Atlantic City Auditorium, Atlantic City, N. J.

July 10-20: International British Plastics Exhibition, Grand and National Halls, Olympia, London, England. Additional information may be obtained from John L. Wood, British Plastics Exhibition, Dorset House, Stamford St., London, England. (See also p. 193.)

July 14-19: George F. Little Management, Ninth Annual National China, Glass, and Tableware Show, Hotel New Yorker, New York, N. Y.

August 25-28: National Association of Furniture Manufacturers, Third Supply, Equipment, and Fabric Fair and Twenty-ninth Annual Convention, Conrad Hilton Hotel, Chicago, Ill.

Companies . . . People

Union Carbide: Name of Union Carbide and Carbon Corp. has been shortened to **Union Carbide Corp.**

Bakelite Co.: W. J. Canavan, with Bakelite since 1947 and formerly manager of the Extrusion Materials Div., appointed assistant manager of the New Product Engineering Dept., responsible for evaluation and promotion of new products in the fields of calendered film and sheeting and molding and extrusion. **L. D. Burnett, Jr.,** with the company since 1946 and previously with the Flexible Packaging Div., now assistant manager of the Film and Sheeting Div. **Wayne B. Lyon** named technical representative for the Molding Materials Div. in the Chicago district office and will handle vinyls, phenolics, polyethylene, and polystyrene. **Charles Lowe,** appointed technical representative for the Extrusion Materials Div. in the Hartford office, will handle polyethylene, vinyl, polystyrene, and fluorothene plastics for extrusion.

Carbide and Carbon Chemicals Co.: Dr. J. T. Dunn, with Carbide since 1937, appointed assistant to **Dr. Franklin Johnston,** director of research. **D. M. Nielsen** named assistant district manager of the New York district sales office and **R. H. Rehm** assistant district manager of the Newark district sales office. At the Institute, W. Va., **J. H. Field** appointed supervisor of the polyethylene area; **D. P. Heath and P. W. Pontius** made department heads in the polyethylene area.

Visking Co.: E. B. Cahn, L. E. Houck, and **B. H. Schenk** appointed vice presidents of the company. Mr. Cahn, presently general manager of the Plastics Div. of Visking, will be vice president of that division. Mr. Houck will be vice president and general manager of the Food Casing Div. Mr. Schenk, presently manager of the International Div., will be vice president in charge of operations.

W. R. Grace & Co.—Polymer Chemicals Div.: Dr. Alio J. Buselli, formerly supervisor of polymer research and development of Air Reduction Co. at Murray Hill, N. J., appointed manager of chemical research at Clifton, N. J., laboratories. His chief concern will be in research on the polymerization of olefins and other monomers for new and improved polymer products. **Norman F. Smith,** formerly with Monsanto Chemical Co., now technical representative of the Marketing Dept.; **Albert Spaak,** previously chief engineer of DeMattia Machine & Tool Co. and Mastro Plastics, appointed injection molding engineer of the Technical Service Dept. **Ruben Thevenet** assigned to the Technical Service Dept. as a plastics extrusion engineer. **Julian A. Rogers,** formerly with Mississippi Chemical Corp. and Hercules Powder Co., Inc., named head of the Manufacturing Dept. at the company's high-density polyethylene plant in Baton Rouge, La. He will be in charge of all production activities related to the manufacture of polyolefin resins.

Catalin Corp. of America has added five stainless steel, insulated trailer tank trucks to its fleet to carry chemicals and synthetic resins to its customers on a special delivery basis.

Stainless steel inside and out, the Heil tank trailers are of clean bore construction, meeting the standards set up for milk trucks regarding ease of cleaning. Thus they can be used to carry any of Catalin's thermosetting resins and special chemicals without danger of discoloration or contamination, according to **Harry Krehbiel,** president.

The General Tire & Rubber Co.—Textileather Div.: Forest Process operations have been moved to Toledo, Ohio, from Bronx, N. Y., for a more complete integration of operations. The move will bring to Toledo the complete manufacturing facilities for production of high-fidelity embossing by which specialized effects in vinyl fabrics may be obtained. Textileather has been supplying the Forrest high-processed embossed vinyl materials principally to the automotive industries and recently has produced new patterns for uppers of men's, women's and children's shoes.

Koppers Co., Inc.—Chemical Div.: Two new sales offices, one to serve the Kansas City, Mo., area and the other in the Twin Cities region of Minnesota and Wisconsin, have been established. **John Sharp** and **Robert C. Clarke** appointed sales representatives in charge of the Kansas City and Twin Cities offices, respectively. **L. R. Hunter,** with the company since 1943, named sales manager for the midwest district; **George Kiessling** transferred from the Development Dept. of the division to the Plastics Products Section to assist the section manager.

Narmco Industries: Two of the six companies comprising Narmco Industries have been merged—**Narmco Sporting Goods Co.** and **Narmco Resins & Coatings Co.** Although the companies will continue to function under their former names and management structure, they will be identified as divisions of the new organization, **Narmco Adhesives & Plastics Co.** Narmco Resins & Coatings Co. will continue to produce structural plastics, adhesives, and coated fabrics. Narmco Sporting Goods Co. will remain in the business of manufacturing tubular, fibrous glass fishing rods, and other high strength, reinforced tubular articles.

Acheson Dispersed Pigments Co.: Charles R. Schroth, formerly with Godfrey L. Cabot, Inc., named sales manager. **William Campbell** made technical sales representative. **Harry E. Knox, Jr.** appointed general works manager in charge of the company's plants in Philadelphia, Orange, Texas, and Xenia, Ohio. **Howard Acheson, Jr.,** formerly assistant to the general manager, now works manager of the Philadelphia plant. **Dario Passigli** named group leader of the Process Research Group in the Research and Development Dept.

The General Industries Co.: Allan W. Fritzsche, who started with the company in 1919 as a motor repairman, elected chairman of the board. He has been president and general manager of the firm since 1943 and will continue as chief executive officer. **William E. Foster,** who started with



A. W. Fritzsche



W. E. Foster

the company in 1941 as a molder in the Plastics Div. and subsequently was advanced to vice president, named president.

Twenty-five years ago the firm's two plants, one in Elyria, Ohio, and the other in Putnam, Conn., were engaged in production of such products as spring phonograph motors, molded plastics, and fishing reels. The total employment was made up of 220 persons working a three-day week, with a payroll amounting to $236,000 per year and an annual volume of approximately $530,000. Today the company consists of four plants, with a new and modern plant at Marysville, Ohio, for injection molding and another at Belleville, Ohio, for increased production of motors. General Industries reached a peak of 2000 employees with an annual payroll in excess of $7 million and a sales volume of over $24 million.

Heyden Newport Chemical Corp.: Research organization of the **Newport Industries Div.** and the Heyden Garfield, N. J., research organization integrated into a single research department under the direction of **Dr. Herman Sokol,** vice president of research and development. **Dr. Carl Bordenca** appointed director of re-

Companies . . . People

search. **Dr. J. Harry Stump** named manager of research at Newport Industries' Pensacola laboratories.

American Plastics Corp. Div.: Roland L. Barratt, formerly sales engineer, appointed manager of the Reinforced and Vacuum Forming Div. at the Bainbridge, N. Y., plant.

United States Plywood Corp. New sales and service area, the North Central Div., with headquarters in Cleveland, established. Its area includes Ohio branches in Columbus, Cleveland, Cincinnati, Toledo, and Youngstown; New York branches in Buffalo, Rochester, and Syracuse; and Pittsburgh, Pa. **Carl W. Justice**, former district manager in Charlotte, N. C., promoted to manager of the new division. **Carroll Cass** promoted from assistant manager to manager at Charlotte, succeeding Mr. Justice. **Malcolm K. Peterson**, formerly Northeast Div. manager, appointed to newly created post of director of merchandising.

Celanese Corp. of America: William P. Orr, previously plant manager of the company's new Fortiflex polyolefin plant at Houston, Texas, named assistant general manager of the Plastics Div. **Burton E. Cash**, with the firm since 1936 and former assistant plant manager of the Houston plant, succeeds Mr. Orr as plant manager.

Du Pont: Dr. John P. Wilkins, who joined the company in 1946 as a research chemist, appointed assistant manager of industrial sales of the Film Dept. **Dr. William H. Wood**, with the firm since 1939, succeeds Dr. Wilkins as assistant manager of sales development and technical service; **Harry S. Carl, Jr.** succeeds Dr. Wood as a sales development supervisor.

Witco Chemical Co.: International Div. formed to handle the sale and manufacture of all company products outside the United States as well as all foreign licensing arrangements entered into by Witco. **Robert I. Wishnick**, chairman of the board of the firm, will direct the operation. **L. D. Carver** appointed manager of technical sales for the new division.

The Hydraulic Press Mfg. Co., a Div. of Koehring Co.: Machinery Sales Co., 2838 Leonis Blvd., Los Angeles, Calif., re-appointed exclusive representative for H-P-M in southern California, Arizona, and Nevada. H-P-M produces injection, compression, and transfer molding presses, die casting machines, and other hydraulic equipment. **William J. Fath** promoted to works manager; **Warren E. Beck** succeeds Mr. Fath as production control manager; **A. L. Wallace** succeeds Mr. Beck as assistant production control manager.

Foster Grant Co., Inc.: Sales offices formerly maintained by the late **Charles S. Jacobsen** at 200 Fifth Ave., New York, N. Y., have been taken over by Foster Grant. Foster Grant accounts previously serviced by the Jacobsen office are now being handled by the firm at this address as well as at the home office in Leominster, Mass. **Paul Conway**, formerly with Celanese Corp. of America, named central representative of the Petrochemical Div.; he will work out of Cleveland and will be responsible for the division's line of chemicals and new plastic materials.

Arthur Colton Co.: Leo P. Gajda, director of engineering since 1951, appointed vice president—engineering; **Bruce M. Regan**, formerly manager of all three Colton plants, named vice president—manufacturing. The firm produces machines and tableting and filling equipment for the plastics and other industries.

American Viscose Corp.: E. Thomas Frankenfield, Jr. appointed a market analyst in the Film Div. **Edward J. Dunn** named chief project chemist in the Technical Dept. at the Marcus Hook, Pa., cellophane plant; he will assume his new duties about July 1.

United States Rubber Co. has completed the transfer of all personnel and equipment from its old central laboratories in Passaic, N. J., to the company's new research center at Wayne, N. J. A staff of approximately 400 will conduct fundamental research in the fields of rubber, plastics, textiles, and chemicals.

Monsanto Chemical Co.—Plastics Div.: Donald K. Webber has joined the Technical Service Dept. at Texas City, Texas. **Dr. Lars Ove Oldsberg**, appointed research chemical engineer of the Research Dept. at Springfield, Mass. **John J. Shay, Jr.** assigned to the sales technical service group at Springfield.

General Aniline & Film Corp.: Warren M. Dewing, formerly assistant branch manager, named New England branch manager, succeeding **Wilfred A. Lord** who has retired after 50 years in the field. **Dr. Robert E. Brouillard** appointed assistant manager of the Pigment Div.; **Emil A. Wich** named manager of the Pigment Technical Dept. of the Dyestuff and Chemical Div. **A. L. Sanchirico**, with the firm since 1945, appointed sales representative of the Pigment Div. to handle sales of pigments in the midwest.

American Lithium Institute, Princeton, N. J., has been launched by three of the four leading lithium producers, with **Marshall Sittig** as president. Purpose of the Institute is to hunt for new markets, especially since one potentially big atomic market seems to have been lost. Significance to plastics is lithium's possibility as a catalyst in production of sterospecific plastics and isotactic polymers.

Allied Chemical & Dye Corp.—Barrett Div.: Whiting N. Shepard appointed manager of Plaskon molding compound sales, succeeding **Henry W. DeVore**, who was recently promoted to director of Barrett's plastics and resins sales. The appointment marks Mr. Shepard's return to the Plaskon organization after a five-year interval in another field. He is a veteran of 19 years with Plaskon, spending the majority of that time in sales. **James P. Barry**, who joined the company in 1951 as a sales trainee, appointed manager, Chemical Sales; he will be responsible for sales of plasticizers, Cumar resins, A-C polyethylene, lubricants, and rubber compounding materials. **Julian S. Pruitt** transferred from Detroit to succeed Mr Barry as Chemical Sales representative in the Cleveland area. **Richard L. Slover** named new Chemical Sales representative in the Detroit territory. **Henry L. Schmitt** appointed Chemical Sales representative in southern New Jersey and northeastern Pennsylvania. **Joseph McGaw**, who recently joined Barrett, assigned to the Research and Development Dept. at the Edgewater Laboratory; he will carry out applications research in the field of phenolic resins. **Thalco Glass Fiber Products**, 765 S. Harvard Blvd., Los Angeles, Calif., appointed West Coast distributor for Barrett's Poly-Lease 77, a low-molecular-weight polyethylene mold lubricant.



W. N. Shepard

Solvey Process Div.: Wilbur H. Brumfield, with the division since 1934, named assistant to the president.

Robert Ernst, formerly manager of Omni Products Corp.'s Plastics Div. and Omni International Corp., has formed his own company, **Robert Ernst Associates Ltd.**, with offices in New York and Zurich, Switzerland. The new firm will devote most of its activity to the conclusion of technical know-how agreements in the plastics and reinforced plastics field in overseas countries for and on be-

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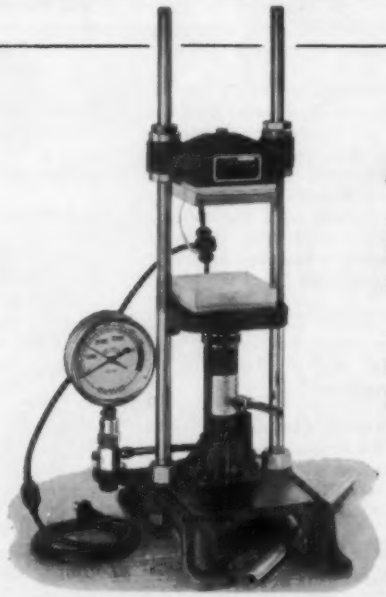
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Companies . . . People

half of leading American manufacturers. Mr. Ernst will also act as consultant on foreign affairs to Omni and other American firms.

Esso Research & Engineering Co.: Dr. Robert W. Krebs, formerly associate director of the Baton Rouge labs, appointed director of the Chemical Research Div. **Dr. Fred W. Banes** now associate director.

Chemical Products Corp.: Joseph S. Hawes, elected vice president in charge of lacquer sales, will direct sales in the field of specialized industrial and decorative coatings for molded plastics, insulated wire, fabric, paper, and jewelry. **Hugh B. Allison** elected vice president in charge of Chem-o-sol plastisol sales.

F. J. Stokes Corp. has opened a new sales office at 1678 Cross Keys Dr., N.E., Atlanta, Ga., to service the southeastern states. **William J. Fisher**, formerly in the Philadelphia district office, is in charge of the Atlanta office. Stokes produces a line of machinery for the plastics industry, including vacuum metallizers, tableting machines, extruders, transfer presses, preformers, etc.

National Polychemicals, Inc.: Ernest A. Swanson named production manager and will be in charge of plant operations. **Joseph P. Flannery**, formerly with Kendall Co. and Monsanto Chemical Co.'s Plastics Div., appointed purchasing agent.

Plastic Inlays, Inc.: Vacuum metallizing plant expanded and a new building devoted to lacquer and paint spraying completed. Reorganized operating personnel as follows: **George E. Nettleton**, sales manager; **William F. Easton**, comptroller; **Charles B. Brown**, purchasing agent; **Bart M. Ficarra**, plant superintendent; and **Arthur Ernst** in charge of metallizing.

H. B. Fuller Co. has moved from 181 W. Kellogg Blvd., St. Paul, Minn., to new and enlarged quarters at 1144 Eustis St. The company produces industrial adhesives.

Thiokol Chemical Corp.: Anthony J. Simonson named manager of market development. **Thomas J. Zito** appointed technical sales representative. The company produces special synthetic rubbers, plasticizers, and chemicals.

Food Machinery & Chemical Corp.—Becco Chemical Div.: John R. Hopkins, with Becco since 1935, promoted to technical assistant to the sales manager. **Ralph J. Gall** named assistant manager of organic research and development. **Fred R. Sheldon**, with the firm since 1939, advanced to research laboratory manager.

Commercial Chemical Development Association: Following officers elected: president-elect—**L. E. Johnson, International Nickel Co.**; treasurer—**W. J. Riley, Food Machinery & Chemical Corp.**; executive secretary—**G. A. Harrington, Amoco Chemicals Corp.**; and directors—**W. M. Barnes, Southwest Research Institute**, and **W. A. Woodcock, Carbide and Carbon Chemicals Co.**

Wheelabrator Corp.: Lawrence W. Kohlmeyer named district manager of the New York office, replacing **Kenneth F. Blessing**, recently made sales manager of the Dust and Fume Control Div. **George F. Jones** new district sales engineer in Chicago.

Westchester Plastics, Inc.: New Color Blending Laboratory is now in operation. Facility is designed to investigate problems in the development and control of exacting color shades and is expected to insure exact duplication of subsequent color orders received by Westchester.

The Patterson Foundry & Machine Co.: Raymond H. Jebens, appointed manager of Customer Application Research, will be responsible for product research and development in addition to customer applications. **George Milburn**, with the company since 1946, named sales supervisor of **The Patterson Foundry & Machine Co. (Canada) Ltd., Toronto, Ont.**

Barber-Colman Co.—Wheelco Instruments Div.: Sub-branch office established at 20 Leland Ave., Columbus, Ohio.

The Borden Co., Chemical Div.: Vincent D. Nutile and **Joseph H. Koslowski** named technical sales representatives of the Coatings and Adhesives Dept. for New England.

Valite Corp. and **Valentine Plantations, Inc.** have merged with **Valentine Sugars, Inc.** The business of Valite will be operated as the **Valite Div.** of Valentine Sugars, Inc. Valite produces phenolic resins, coatings, and adhesives.

Emery Industries, Inc.: James W. Ritz, with the firm since 1941, promoted to assistant sales manager of the Organic Chemical Sales Dept., responsible for sales of plasticizers, lubricant esters, fatty acid esters, azelaic and pelargonic acids, and high-molecular-weight polybasic acids. He succeeds **R. T. Hull**, recently named vice president and general manager of Emery's newly acquired Canadian subsidiary, **Emery Industries (Canada) Ltd. W. N. Fieglein**, assigned to southwest sales territory, will handle fatty acids.

Cadillac Plastic & Chemical Co.: New sales office established at 500 Santa Fe Bldg., Dallas, Texas. This is Cadillac's eighth. **Ernie Dourlet**, formerly with Rohm & Haas Co., appointed sales representative in charge of the new office. The firm has recently been appointed distributor of fibrous glass reinforcing materials for plastics products by **Owens-Corning Fiberglas Co.**

H. G. Jacobs Mfg. Co., Inc. has moved from 124 E. 124th St., New York, N. Y., to its new plant at 159 Linwood Ave., Paterson, N. J. The firm manufactures plastic tool handles and other industrial items. A wholly-owned subsidiary, **Impacto Plastic, Inc.**, is also located at the same address.

Alpha Plastics, Inc.: Six stocking distributors to carry Alpha's line of PVC pipe, PVC fittings and PVC valves appointed: **Mayer-Malbin**, Astoria, L. I., N. Y.; **John Wilfert, Inc.**, Brooklyn, N. Y.; **Ward Bros. Mill Supply**, Lockport, N. Y.; **J. Heller & Sons**, Newark, N. J.; and **Missouri-Kansas Supply Co.**, Kansas City, Mo.

Danco Tool & Mold Co. has moved from Clifton Heights, Pa., to new, enlarged quarters at Wheatland and Mellon Sts., Phoenixville, Pa.

L.O.F. Glass Fibers Co.: Eugene Sinnett, formerly plant manager, named general manager of the Corrulux Div. **James L. Neill**, formerly division comptroller, succeeds Mr. Sinnett as plant manager. **Paul W. Burkmeyer** assigned to the Los Angeles sales office as a field representative for industrial sales.

Innis, Speiden & Co., Inc., 1607 Howard St., Chicago, Ill., appointed exclusive representative for Wisconsin, Illinois, Indiana, and western Michigan by **Chase Chemical Corp.**, Pittsburgh, Pa. The firm will sell polyisocyanate resins for urethane foams, naphthenate, and tallate paint driers.

Bassons Industries Corp., Yonkers, N. Y., has filed a petition for arrangement under Chapter XI of the **Bankruptcy Act.** The proceeding has been referred to **Referee Arthur J. Doran** who has continued Bassons Industries Corp. as debtor in possession in the operation of its business. A further order signed by Referee Doran restrains and enjoins

all creditors from instituting or proceeding with suit. Pursuant to said court order, the debtor is prohibited from paying any claim which accrued prior to March 23, 1957.

The Dayton Rubber Co.: Automotive Wholesalers Div. will act as sales representative through automotive parts distributors and jobbers for the expanded line of automotive tapes manufactured by the company's **Holfast Div.** at Atlanta, Ga., replacing previous distribution by manufacturers' representatives. The firm produces plastics tapes.

G. & W. H. Corson, Inc., Plymouth Meeting, Pa., distributor of Styrofoam in eastern Pennsylvania, Delaware, and New Jersey, will also handle the product in Virginia, Maryland, and northeastern W. Virginia by **The Dow Chemical Co.**

National Research Corp.: Dr. James H. Gardner and **Arthur G. Walsh** have been promoted to assistant directors of the Research Div.

Frank W. Reinhart, chief of the **Plastics Section** of the **National Bureau of Standards** was awarded the Department of Commerce Silver Medal for Meritorious Service. The award recognized his "major contributions to the science and technology of plastics, and for highly distinguished authorship." **Mr. Reinhart directs the** Bureau's diverse research, development, and testing program on plastics, plastic coatings, and adhesives. Among the recent developments of this program are plastic springs which have a higher strength-to-weight than most metal springs, improved transparent eyeshields for the military, and a shatter- and craze-resistant plastic for use in combat aircraft.

Mr. Reinhart is currently chairman of the Committee D-20 on Plastics of the **American Society** for **Testing Materials.** He also served as chairman of the Committee D-14 on Adhesives of ASTM. Mr. Reinhart is a past president of the Society of Plastics Engineers.

William L. Abramowitz elected president of **The Carlon Products Corp.,** Cleveland, Ohio, manufacturer of plastic pipe and custom fabricated fittings. Mr. Abramowitz formerly was a vice president of Borden Co.'s Chemical Div. and was the founder and president of American Resinous Chemicals Co.

Dr. Leo Wall, a chemist at the **National Bureau of Standards,** has been presented with the **Arthur S. Flemming Award** which is given annually to 10 outstanding young men in Government. The awards, made annually by the District of Columbia Junior Chamber of Commerce, recognize the accomplishments of young men in Federal employment.

Dr. Wall is recognized as one of the world's outstanding authorities in the field of polymerization chemistry. His fundamental contributions in this field have greatly aided such industries as the plastics and rubber in the development of new types of materials having unusual chemical and physical properties.

Hermann K. Intemann, well known in the plastics industry as former general sales manager of **Bakelite Co., a Div. of Union Carbide and Carbon Corp.,** has been made president of **Electro Metallurgical Co.,** another division of Union Carbide.

Albert J. McMullen elected vice president of **The Garlock Packing Co.,** Palmyra, N. Y. He is president of **United States Gasket Co.,** Camden, N. J., plastics division of The Garlock Packing Co. Garlock manufactures seals, packings, and gasketing.

Frank L. Pyle, with the company since 1942 and former works manager of the Orange, Texas, Works, elected vice president of the Plastics Div. of **Spencer Chemical Co.,** Kansas City, Mo. Mr. Pyle, responsible for all plastic products, including polyethylene and nylon, will direct

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INDUSTRIAL GLASS FABRIC. Folder contains specifications chart for company's industrial glass fabrics available in standard widths of 38, 44, 50 and 60 in., or woven to order. J. P. Stevens & Co. **(F-701)**

AUTOCLAVES AND VULCANIZERS. Catalog illustrates and describes line of autoclaves and vulcanizers that can be used for low pressure thermoset molding of large objects. Adamson United Co. **(F-702)**

COATINGS FOR PLASTICS. Technical data sheet describes lacquers and decorative coatings for polystyrene and acrylic. Includes properties and performance data. Standard-Toch Chemicals, Inc. **(F-703)**

SHEETS, RODS, TUBES. 18-page brochure describes machining qualities, properties and applications for company's "Astralon" vinyl sheet, rod, and tube stock. Dynamit-Actien-Gesellschaft. **(F-704)**

PHENOLIC RESINS. Bulletin describes properties, solubility with chemicals of two phenolic resins. Also includes processing and application data. BASF. **(F-705)**

DECORATED MYLAR FILM. File-size folder contains sample swatches of metallized and embossed Mylar laminated to such backing materials as vinyl, butyrate, fabric, latex, paper. Physical and chemical properties are described. Coating Products. **(F-706)**

POLYETHYLENE SPECIFICATIONS. 16-page booklet contains specifications data, including resistance to chemicals, resistance to weathering, color characteristics, and general, mechanical, and electrical properties of "Tenite" polyethylene. Eastman Chemical Products, Inc. **(F-707)**

VINYL FOAM. 14-page brochure describes applications and limitations of "Vinylfoam", particularly suitable for cushioning, safety applications. Elastomer Chemical Corp. **(F-708)**

EXTRUDERS. 8-page booklet contains comprehensive description and illustrations of line of extruders with 2 to 6 in. screw diameters. Contains blueprint with detailed specifications. John Royle & Sons. **(F-709)**

STEEL FOR MOLDS. Folder describes features, illustrates applications of prehardened die steel, ready for use without further heat treatment for injection and compression molds. Heppenstall Co. **(F-710)**

MOLDED PLASTICS MANUAL. 8-page booklet contains case histories of molded plastics applications developed by Illinois custom molding service with facilities for design, mold making, compression, transfer, injection molding. Also discusses company's "Insurok" laminated plastics. The Richardson Co. **(F-711)**

● Any of the booklets described here, plus many others—forty-four in all—are available for the asking, without charge or obligation. Just turn to the Manufacturers' Literature page in this issue (it's printed on heavy paper), circle the numbers corresponding to the booklets you want, fill in the reply postcard, and mail. No postage needed.

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all activities affecting them, such as production, quality control, product improvement, sales, distribution, and technical service.

Les Smetana appointed technical sales representative to midwestern electronics industries by **Tri-Point Plastics, Inc.** and its subsidiary, **Tri-Point Manufacturing, Inc.**, Albertson, N. Y. His headquarters will be at 5306 W. Lawrence Ave., Chicago, Ill. Tri-Point Manufacturing specializes in extrusion of Teflon rod; Tri-Point Plastics does machining of Teflon and other industrial plastics into components for the electronics, aircraft, chemical, and other industries.

David E. Gregory named sales manager of **Shoe Form Co., Inc.**, Auburn, N. Y. He will be in charge of all shoe and hosiery form sales promotion as well as the Utility Plastic Box Div.

Milton Rex Wingard appointed vice president—technical director, and elected to the board of directors of **Davidson-Kennedy Associates Co.**, Atlanta, Ga., designers and builders of chemical process plants and facilities.

Richard C. Horton, formerly with Owens-Corning Fiberglas Corp., now with the Fiber Glass Dept. of **J. P. Stevens & Co., Inc.**, New York, N. Y. He will be concerned with research and development work on both industrial and decorative glass fabrics.

Gilbert G. D'Andrea, formerly with Bassons Industries, Inc., has joined **Durable Formed Products, Inc.**, 6 Greene St., New York, N. Y., as director of product development and engineering.

Richard S. Sansone has joined **Mobay Chemical Co.**, St. Louis, Mo., as a market development specialist.

Dr. Thomas G. Fox, formerly a research executive of Rohm & Haas Co., appointed an assistant director of research of **Mellon Institute of Industrial Research**, Pittsburgh, Pa. Dr. Fox will head the programs of polymer research at Mellon.

Emanuel Raices, formerly with Jason Corp., appointed product manager for vinyl wall coverings for the Cotan Div. of **Interchemical Corp.**, Newark, N. J.

Warner H. Tabor elected assistant vice president of **Dixon Corp.**, Bristol, R. I. Mr. Tabor is Dixon's chief engineer in charge of product development for both the Plastic and Textile Depts. Before joining the company in 1950, he was engaged in

research and engineering at the Whitin Machine Works. Dixon's Plastic Dept. specializes in extruding and molding Teflon and Rulon. The latter is a bearing material, developed by Dixon, which never requires lubrication.

J. L. Galt, formerly manager of the company's phenolic product plant at Pittsfield, Mass., now West Coast marketing manager of **General Electric Co.'s Chemical Materials Dept.** He will serve western markets with Glyptal alkyd resins for the paint industry, and polyester resins for reinforced plastics from manufacturing facilities at Anaheim, Calif.

Green Plastics Corp. has moved from Wakefield, R. I., to Hope Valley, R. I., 30 miles southwest of Providence on Canonchet Rd. Manufacturing space has been more than doubled.

Alfred G. deMeurisse, formerly with Barrett Div., Allied Chemical & Dye Corp., now New York district sales manager of the Chemical Div. of **General Mills, Inc.** He will supervise sales of General's Versamid polyamide resins, fatty nitrogen compounds, fatty acids, fatty methyl esters, and sterols to eastern and coastal markets.

J. Burchenal Ault named sales manager of the **Horace Linton Div.** of **Hess, Goldsmith & Co.**; he will assist **W. R. Linton**, vice president, in the sale and distribution of fibrous glass narrow fabrics to the plastics and electrical equipment industries.

W. John Porter, Jr., engineer for the **Hamilton Div.** of **Baldwin-Lima-Hamilton Corp.**, assigned to the New York district sales office. He will direct sales of mechanical, hydraulic, and compacting presses made by Hamilton in eastern New York, Long Island, Connecticut, and northern New Jersey.

Alden H. Davis, of **Columbian Carbon Co.**, Akron, Ohio, appointed resident technical service manager in Sao Paulo, Brazil, for **Companhia Petroquimica Brasileira-Copebras**, jointly owned by Columbian Carbon Co., **Celanese Corp. of America, Traders, Inc.**, and Brazilian interests. The company plans to manufacture carbon blacks. Initial capacity is anticipated to be 30 million lb. of carbon black annually. Production is scheduled to start in 1958.

Edward Filiurin appointed sales manager of the newly formed Vinyl Plastic Sheeting Div. of **Elm Coated Fabrics Co., Inc.**, New York, N. Y.

William V. Cross appointed manager of sales development for **National Aluminate Corp.'s Ion Exchange Div.** He will market Nalco's binding agents for investment casting and

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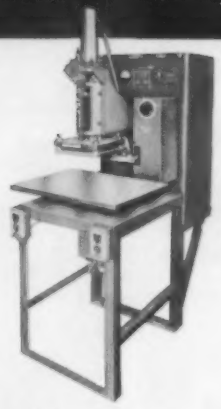
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new mold release agents for die casting and plastic molding operations. Mr. Cross will also be concerned with water treating and specialized applications of Nalcite ion exchange resins.

Harold C. Klassen named sales manager for plastics of the Resins & Chemicals Div. of the **Jones-Dabney Div.** of **Devoe & Raynolds Co., Inc.** He will concentrate on the sale of Epi-Rez epoxy resins and will be responsible for the recently established Jones-Dabney Plastics Technical Service Dept.

A. Robert Stone, formerly plant foreman, now assistant general manager of **Stone Machinery Co.,** Manlius, N. Y., manufacturer of high-speed cutting machinery for the plastics and other industries.

Dr. Martin Sackoff named director of research of **Duralith Corp.,** Philadelphia, Pa., manufacturer of plastic name plates, instrument panels, etc.

John C. Louer, formerly with Elmer E. Mills Co., now with **Artag Plastics Corp.,** Chicago, Ill., injection molder. He will be in charge of production control.

Edward Klein, industrial designer, retained as visual design consultant by **Victory Mfg. Corp.,** Chicago plastics molder. He will design and develop plastic items in the housewares, premium, adult game, notion, and other fields.

Howard H. Leiner, member of the Resin and Polymer Section, appointed executive chemist of **Resin Research Laboratories,** Newark, N. J. His specialty is high polymers.

John T. Dillworth appointed vice president of **Baird Chemical Corp.,** New York, N. Y.

Edward V. Huda, with the Raybestos Div. since 1946, named to direct research and development for the Adhesives Dept. of **Raybestos-Manhattan, Inc.,** Bridgeport, Conn.

John C. Vogel, formerly with Plastic Film Corp., named a sales representative for **The Stanley Chemical Co.,** East Berlin, Conn., covering northern New Jersey. Stanley Chemical produces organosols, plastisols, coatings, and other products.

Chester A. Olsen, Jr., Chicago, Ill., appointed distributor of plastics produced by **Seiberling Rubber Co.,** including Seilon vacuum formable sheet and extruded polyethylene in Illinois, Indiana, Wisconsin, and Minneapolis, Minn.

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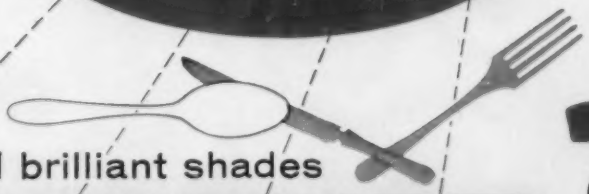
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THE HARSHAW CHEMICAL COMPANY

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Classified Advertisements

Modern Plastics reserves the right to accept, reject or censor classified copy.

Employment

Business opportunities

Equipment

Used or resale only

Machinery and equipment for sale

FOR SALE: (6) 100 ton, 10" ram, 10" stroke @ $1250; (7) 200 ton. 9" stroke, 14" ram, 36x36, @ $2150; (6) 200 ton, 9" stroke, 15" ram, 30x30 @ $1850; (1) ton complete, 18x18 @ $1850; (1) 200 ton 16" ram, 30x30 @ $2450; (2) 200 ton 16" ram, 42x42 @ $2850; (1) 200 ton, 15" ram, 42x42 @ $2600; (3) 250 ton (2) 12" ram, 30x60 rebuilt @ $3675. Hydraulic Sal-Press Co., Inc., 386-90 Warren Street, Bklyn, N.Y.

FOR SALE: Markem Printing Machine, high production, semi-automatic dial feed model 25AD-2C Printer. Suitable for imprinting plastics, paper, cloth, flat packages, products or parts. Immediate delivery. May be tested in operation. Reply Box 2316, Modern Plastics.

FOR SALE: 64 Oz. Injection Molding Machine with Pre-Plasticizer. 750 Ton Clamp. Mold Size 32" vertical, 50" horizontal. 8 & 4 oz. Injection Molders. Aaron Machinery Co. Inc., 45 Crosby St., New York 12, N. Y. Tel.: WAlker 5-8300.

FOR SALE: Available at bargain prices: Baker Perkins 50 gallon Steel and Stainless Steel Steam Jacketed Heavy Duty Mixers with Stainless Jacketed Blades, motorized power tilting, motor driven. W & P 200 gallon Heavy Duty Mixer, tilting type, with Sigma Blades. J. H. Day from 1 qt. to 150 gal., Imperial and Cincinnatus D.A. Jacketed, Sigma Blade Mixers. Day 15 to 10,000 lbs. Dry Powder Mixers. Mikro Bantan, 1SH, 1F, 2TH, 3TH Pulverizers. Day, Rotex, Tyler-Hummer, Great Western Sifters. Package Machy. FA, FA2, FA4, Miller, Hayssen, Scandia, Hudson Sharp, Oliver Auto. Wrappers—all sizes. This is only a partial list. Over 5000 machines in stock available for immediate delivery. Tell us your machinery requirements. Union Standard Equipment Co. 318-322 Lafayette St., New York 12, N.Y.

FOR SALE: 32 oz. Watson-Stillman, Model 650E, 1951; 20 oz. H.P.M., 1954; 16/20 oz. Reed-Prentice, 1956; 16 oz. W-S & H.P.M.; 12/16 oz. DeMattia, Model C, 1951; 12D-12 oz. Reed-Prentice; 8 oz. Reed-Prentice, w/plunger advance, 1950, $8500; 8 oz. R-P, 1946, $6000; 8 oz. Lester w/solid frame, 1946, $5000; 8 oz. Fellows, 1953; 9 oz. H.P.M., 1946, w/weigh feeder; 8 oz. DeMattia, toggle type, very reasonable; 4 oz. Impco, 1951; 4 oz. Lester, $3000; 4 oz. H.P.M., 1946, $3500; 4 oz. Lewis, 1953, $4250; 4 oz. Impco, 1951; 2 oz. Mosio, Model 73; 2 oz. Van Dorn, lever type; 1 oz. Van Dorn, hand; 1 oz. vert. Watson-Stillman; 150 ton Stokes w/trans. ram; Auto-Vac vacuum forming mach., w/30"x50" moldable area & drape attach.; double-end tumblers; grinders; ovens, etc. Partial listing—other equipment available. Acme Machinery & Mfg. Co., 2315 Broadway, New York 24, N.Y. Tel.: SU. 7-1705.

FOR SALE: One Sixty-six inch hi-vacuum machine, National Research make. Fully equipped with air operated valves, two sixteen inch diffusion pumps, Booster pump, 300 foot Kinney pump. In excellent working order and condition. Fast cycles. Metalplast Process Inc., 34-51 56th St., Woodside 77, L.I., N.Y.

FOR SALE: Surplus equipment—Injection Molding Machines up to 60 oz.—Compression Molding Presses—50 ton 12" x 12" Laboratory Presses—Carver Laboratory Presses rebuilt and guaranteed—6" x 13" Laboratory Mills—¾" Double Solenoid Control Valves 3000 psi—Partial List—Send us your inquiries. Plastic Machinery Exchange, 426 Essex Avenue, Boonton, N. J.—Telephone DEerfield 4-1615.

FOR SALE: 1—1948 Impco Transfer Molding Machine, Model VF type 822, 350 Ton Clamp Down Action, 50 Ton Transfer UP Action. Greatly reduced for immediate disposal. Reply Box 2314, Modern Plastics.

LIQUIDATION.
Transfer Molding Presses
Late type-self contained
1—300 ton Stokes
2—200 Ton Baldwin-Southwark
2—150 ton Stokes
1—100 ton Stokes
10—Thermall Preheaters.
Reply Box 2310, Modern Plastics.

FOR SALE: Four thermatron high frequency generators, one each type 6OS-6KW; type 3OS-3KW; type 15S-1.5KW; type K1-1KW. Also two small presses and voltage regulators. Contact Interstate Manufacturing Corporation, 100 W. Market St., Newark, N. J.

FOR SALE: Vacuum Metallizer 36". Injection Presses: 8, 12, 16, 24 oz. Reed. 2, 4, 9, 16, 20 (1954) oz. HPM. 8, 12 oz. Lester. 8 oz. vertical Giddings, 4 oz. Lewis. 4 oz. vert. DeMattia. 1, 2 oz. Van Dorn. Extruders: 3" Bandera. 2½" oilht. NRM. 2½" Hartig. 24" & 30" Sheet Dies. 30" & 52" Pull-off. 48" Sheet stacker. 14" & 6" Dulmage Meter Pumps. Conveyors. Despatch 48"x72" Sheet preheat Oven. Cumberland Model O & Leominster 5 HP grinders. Apex 2 color Container Imprint mach. Various Compression & Transferpresses 50 to 600 T. Elmes Hydrolair press 30 T. La Rose Champ & Model 50 Electronic Preheaters. Stokes 280 G. Preformpress. Baker-Perkins 200 gal. Mixer. 42 cu. ft. Robinson Ribbonmixer. Vac. Forming mach. 40"x60". List your surplus equipment with me. All Midwest locations. Wanted 50 T Stokes Standard Compress. 24 oz. & 32 oz. HPM or Watsons. 1½ to 4½" Extruders. Justin Zenner, 823 Waveland Ave., Chicago 13, Illinois.

FOR SALE: 1 Modern Plastics 1¼" electric extruder; 1 Stokes standard 150 ton molding press; 2 Cumberland 14" rotary choppers; 2 Stokes model R and T preform presses; 5 self-contained laboratory presses, 10, 30 and 50 tons; also mills, cutters, mixers, etc. Chemical & Process Machinery Corp., 52 Ninth Street, Brooklyn 15, N.Y.

FOR SALE. Just released by one of the largest plastic molders the following "HPM" Horizontal Hydraulic Injection Molding Machines. We have (1) "HPM" 350 H 12 oz., (5) "HPM" 200 H 9 oz., (1) "HPM" 100 H 4 oz., all machines are late models and have been operating about 50% of the time. They have had the best maintenance by expert operators and maintenance men and just recently have been completely overhauled. Just hook them up and you're in business! We also have one Lester 12 oz. fully automatic plastic injection machine and two Lester 6 oz. (Model 2B) plastic injection machines. We have a Stokes Model "F" Preform Press, Stokes Tablet Press Model S4 (40 ton); Stokes Tablet Press Model P3 (80 ton); Kux Tablet Press Model 64 (35 ton); Colton Tablet Press No. 5 (25 ton); Stokes Model 43A Oscillating Granulator with stainless discharge hopper; Day type C (80 gal.) Blender with stainless body. All the equipment we offer is in prime condition and we will quote attractive prices.
GLOBE TRADING COMPANY, 1815 Franklin Street, Detroit 7, Mich. Phone-Woodward 1-8277.

FOR SALE: New Dual Pumping Units in stock, Custom Built: Rebuilt Hydraulic Presses Baldwin 8 openings 42" x 42" 700 ton; Baldwin 26 x 26" 50-75 tons; D & B 10-60 tons 12" x 12"; Laboratory Presses, Preform Machines, etc. Universal Hydraulic Machinery Co., Inc., 285 Hudson St., New York 13, N.Y.

FOR SALE: 2500 Ton downstroke 54"x 102". 800 ton laminating press with 23 openings 26"x38" 500 Ton Baldwin downstroke 32"x36". 300 ton Laminating Press with 10 openings 40"x40" 300 ton upstroke press 22"x35". Elmes 200 Ton 28"x 26". Farrel 200 ton 30"x30". 200 ton Hobbing Press 18"x14". D & B 140 ton, 36"x 36". French Oil 100 ton 25"x20". Adamson 80 ton 20"x20". Farrel 200 ton 20"x80". French Oil 120 ton self-contained 18"x22" Elms 75 ton 24"x18". Also Lab. to 2500 tons from 12"x12" to 48"x48". Hydr. Pumps and Accumulators. Stokes Automatic Molding Presses. Van Dorn 1 oz. Injection Molding Machine. Mills and Calenders to 84". Seco 6"x13" and 8"x16" Mixing Mills and Calenders. Plastic and Rubber Extruders. Oxford 57" Slitters. Rotary and single punch Preform Machines, ½" to 4". Injection Molding Machines 1 oz. to 60 oz. Baker-Perkins & Day Jacketed Mixers. Ball & Jewell #1—15HP Plastic Grinders, and other sizes. Gas boilers. Partial listing. We buy your surplus machinery. Stein Equipment Co. 107-8th Street, Brooklyn 15, New York Sterling 8-1944.

FOR SALE: 1-Baker Perkins size 15USE, 100 gal. all stainless double arm Vacuum Mixer; 1-Baker Perkins size 15VUMM, 100 gal. double arm Mixer, 100 HP motor; 6-day 250 and 100 gal. double arm Mixers; 1-Ball & Jewell #1 Rotary Cutter; 2-Two Roll Mills 6"x12"; 6-Stokes Model DD2, DS3, D3 and B2 Rotary Preform Presses; 4-Stokes Model "R" single punch Preform presses; 1-Kux Model 15-25 Rotary Preform Press; Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment; Brill Equipment Co., 2407 Third Ave., New York 51, N.Y.

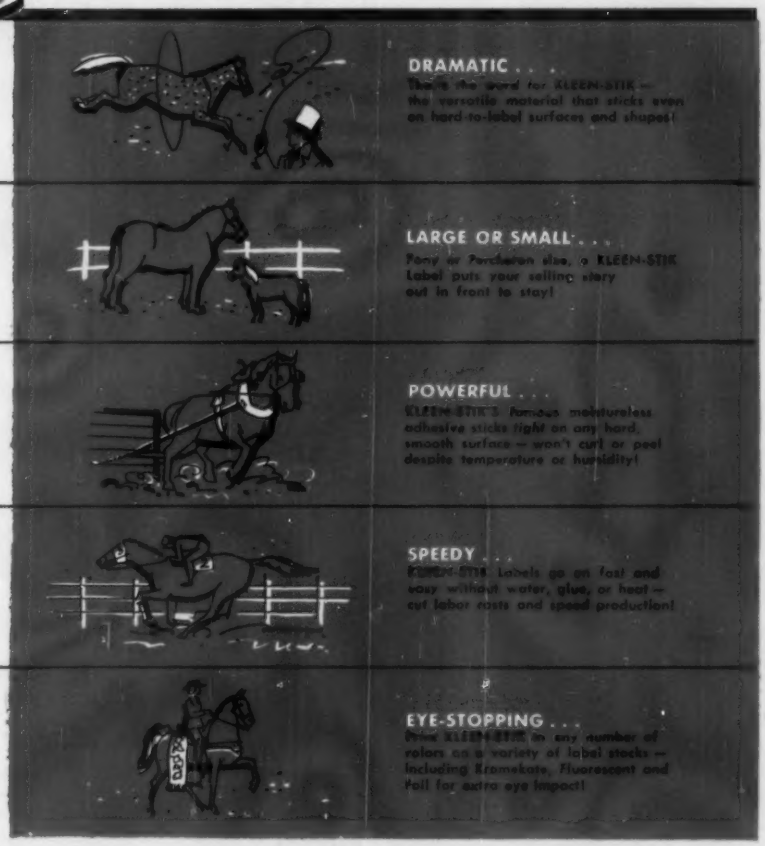
(Continued on page 326)



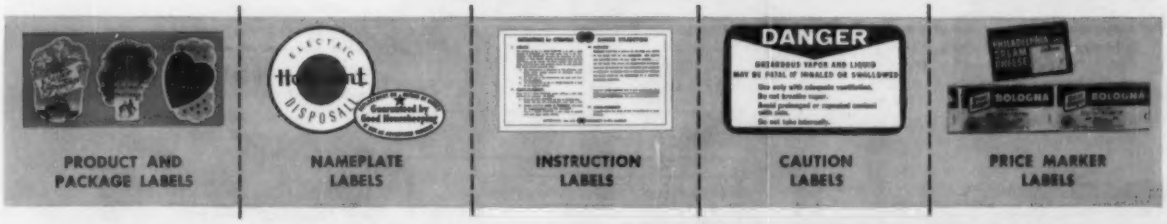
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(Continued from page 324)

PLASTICS MACHINERY

Cutters, Rotary, Plastic
Ball & Jewell #1 with 10 HP MD
Ball & Jewell #2 with 40 HP MD, Extra Knives

Extruders
Hartig 2" Elec. Htd., 7½ HP Reliance V-S Drive, 98% New
Hartig 3¼" Elec. Htd., 45" Barrel, 20 HP Reliance V-S Drive

Injection Molding Machines
2 Oz. Van Dorn, Oversize Cylinder, Model H-200
16 Oz. Reed-Prentice No. 10-E-16, Elec. Htd., 1948

Mills, Rubber/Plastic
6" x 13" Lab Type with 5 HP MD
18" x 50" Farrel, Rubber/Plastic, 75 HP MD

Presses, Molding
15 Ton Baker Fully Automatic
15 Ton Stokes No. 200 D-2 Automatic (10)
15 Ton Dennison 12 Station Indexing Table, 10 HP MD Pump
30 Ton Baker Full Automatic Model 958, Excellent Condition, New 1951
40 Ton Francis, 4 Opening, 12" x 12" Elec. Heated Platens
50 Ton Stokes, Semi-Auto., Self Cont.
75 Ton Watson-Stillman Fully Automatic, 20" x 20" Platen 5 HP MD
100 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
100 Ton Lake Erie Hi-Speed, 24" x 24" Bed, 12" DLO, Self Cont.
113 Ton French Oil Mill, 6 Opening, Elec. Htd. Platens 15" x 18"
113 Ton R.D. Wood, 5-Opening Elec. Htd. Platens 14" x 20"
150 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
175 Ton Viceroy Slab-Side 24" x 24", Elec. Htd. Platen with Hand Pump
200 Ton C Frame Upmoving Press, 25" F-B x 36" R-L
200 Ton Stokes Semi-Automatic, Power System, Timing Controls
225 Ton Farrel 14" Ram x 18" Stroke, L-R 26½" x F-B 24½" 7½ HP MD
300 Ton Watson-Stillman Transfer Press, 33½" x 27" Platen, Main Ram 18" Dia. x 18" Str., Self-Contained
300 Ton Stokes Semi-Automatic, Power System, Timing Controls
314 Ton Lake Erie 36" x 36" Semi-Automatic, Push Button Controls 10 HP Pump & Motor
625 Ton Farrel, Steam Platens 52" x 52", Pump, Mtr., Controls, Under Power
669 Ton, Morane, 3 Upmoving Rams. 16" Stroke
700 Ton Erie, Multi-Opening 42" x 42" Steam Platens
4000 Ton Mesta, 3 Upmoving 30" Rams x 20" Str. Bed 34" x 351"

Presses, Hobbing
400 Ton Robertson, 13" Ram x 4" Stroke complete with pumps & 15 HP MD

Furnaces and Ovens
Megatherm, 3/60/220, 3 KW, 2-3 lb. Phenolic Per Min. (8)
Despatch Mdl. P1hd-8 8 Drawers, 12 x 18 x 2½" (2)

Tablet Machines
Model "E" Stokes, Complete with MD
Model R Stokes, Single Punch, Variable Speed Motor Drive. 3 HP
No. RB-2 Stokes, 16 Station, Motor Drive, 2 HP
Model 45 Defiance, 200 Ton, 15 HP, Vari-Speed, MD
Model F, Stokes, Single Punch, MD
No. 5 Arthur Colton, Motor Drive, 3 HP
No. DDS-2 Stokes, 23 Stations, US Vari-Drive, 10 HP
Model T Stokes Hydraulic Equalizer, MD

Mixers
No. 3A Banbury, 150 HP Md Rubber/Plastic
No. 3 Banbury 75 HP MD Excellent Condition Slide Door Construction

Calenders
24" x 48" Farrel-Birmingham, 3 Roll, 50 HP DC Motor
9" x 48" American Tool 4 Roll Doublina, Belt Drive
6" x 13" Elec. Htd. 6 Roll Lab Type. 7½ HP MD
6" x 16" Thropp 3 roll Chromium Plated. 7½ HP D.C. Motor, Power Take-Up

Pelletizers
Mitts & Merrill Model 10-N-6 15 HP V.S. Drive

Make Us Your Prime Source for All Types of Plastics Machinery
Hydraulic Presses from lab size to 5,000 ton
Injection Molders from ⅛ oz. to 60 oz. size
Extruders from lab size to 12"
Plastic & Rubber Mills and Calenders up to 84" size
Tablet Preform Presses, single punch and rotary, all sizes
Mixers all sizes, types and capacities

Also a complete selection of tumbling barrels, take-up equipment, hydraulic power units, pumps, ovens, blenders, scrap cutters, pelletizers, coating equipment and laminating equipment.

JOHNSON MACHINERY Co.
683-P Frelinghuysen Ave., Newark, N.J.
What Do You Need? What Have You To Sell?

FOR SALE: 4 60-ton Oil Hydraulic Presses, mounted 2 on a single base, with internal pullbacks. 3000 P.S.I. 7¼" bore, 8" stroke. 8 50-ton Oil Hydraulic Presses, mounted 2 on a single base, with internal pullbacks. 3000 P.S.I. 7¼" bore, 8" stroke. 8 50-ton Oil Hydraulic Presses, mounted on individual base, with external pullbacks. 3000 P.S.I. 7¼" bore, 8" stroke. 1 Racine Pump, including mounting base and reservoir, 4F1327, 7½ H.P. motor. 1 Racine Pump, including mounting base and reservoir, 2FA8888, 3 H.P. motor. 1 Racine Booster, DD966, Ratio 4-1. Electrical equipment available for automatic operation of above machinery. Other equipment available. Contact Germanow-Simon Machine Co. Inc.,408 St. Paul St., Rochester, N.Y.

FOR SALE: Sets calender rolls 62" width, 20" dia. rolls max. opening 3". Controls so full mesh is retained on gears regardless of roll position. Full set spare parts available. Haveg Industries, Attn: Mr. Scott Norris, Plant Manager, 900 Greenbank Rd., Marshallton, Delaware.

FOR SALE: Tooling for fiber glass reinforced Tote Boxes 1—23¾" x 11⅜" x 5", 1—21¼" x 11½" x 8½", 1—50-ton Press. Real opportunity. Reply Box 2324, Modern Plastics.

FOR SALE: Stokes Preform machines: one each DD-2 and D-3; and two D-4's. Reply Box 2323, Modern Plastics.

FOR SALE: Injection Molding Machines—8 oz. Reed, Lester, Wat-Still.; 12 oz. Reed, Crow, Lester.; 20 oz. Lester; 24 oz. Reed. Extruders—2", 2½", 6", 8", Royle #1 & #2. Presses 1000 Ton—66" x 50", 500 Ton—42" x 40", 500 Ton—16" x 42"; Also Stainless Steel Reactors, Mixers, Cutters & Tanks. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

RAW MATERIAL MIXING PLANT: Complete, for phenolic molding and similar lines, never used, in original crates cost $250,000. 24"x60" Farrel plastic two roll mills, gear reduced and drive; conveyors, premixers, sifters, valves, crushers, scale, blenders, screen, dryer, dust collector, cutters. Will sell all or part. 32-22-16-12-8-6-4-2oz. Reed, W. Stillman, Lester Injec. Molding Mchne. 500-350-150 ton metal or plastic down acting presses; new 1942 #9 standard 4 rod compound upacting geared toggle press; 200 T. 24"x24" platens; with roll feed and excellent condition. National 2½" Oil Heated Plastic Extruder, New '46; good condition. Cumberland Stair Step Diver; new '53, four knife rotor, 15 HP, 1800 r.p.m. motor. Eveready Box 638; Bridgeport, Connecticut, EDison 4-9471 E. J. McCallum, Jr.

Machinery and equipment wanted

MACHINERY WANTED: Hydraulic Press used, with 8 or 10 daylite openings. 22"x52" or 24"x54", complete with pumps and accessories. Reply Box 2302, Modern Plastics.

Materials for sale

FOR SALE: Plasticizer, Dark in color. 80% D O S, 20% D O P. 250,000 lbs. Bulk available immediately. Excellent for dark color Vinyls, etc. Superior low temperature properties. Far below market price. Reply Box 2327, Modern Plastics.

FOR SALE: Natural Ethyl Cellulose, Claude P. Bamberger, Inc., One Mount Vernon Street, Ridgefield Park, New Jersey. Telephone: HUbbard 9-5330. Not connected with any other firm of similar name.

Materials wanted

WANTED.
Plastics Scrap and Rejects of all kinds. Ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
Reply Box 2308, Modern Plastics.

WANTED.
Vinyl, polyethylene and styrene scrap for our manufacture of molding and extrusion compounds. We can use rigid from vacuum forming, lumps, bleeder, slabs, trimmings, rejects—anything suitable for reprocessing. Send samples and details or telephone. Steady buyers since 1940.
Rotex Rubber Company, Inc.
1-23 Jabez Street, Newark 5, N.J.
MArket 4-4444

PLASTIC SCRAP WANTED: All types and grades, any quantity. Write or telephone. Success Plastics Recovery Works, Inc., Post Office Box 506, Indianapolis 6, Ind. Phone Liberty 6-2919.

WANTED TO BUY. Vinyl Plastic Scrap. Send samples and best price to Joyce Iron & Metal Co., Box 4566 Ft. Hays Station, Columbus, Ohio.

Molds for sale

FOR SALE: A number of Compression Type Plastic Molds, to produce Ashtrays, Cigarette Caskets, Household Articles, Lipstick Cases, Flapjacks and Fancy Goods etc. All Molds in good condition. A once-in-a-lifetime bargain for an established manufacturer, or a rare opportunity for someone, entering the manufacturing field. Write for complete information. Reply Box 2313, Modern Plastics.

FOR SALE: Complete sets of Molds for manufacturing fiber glass boats. Leading fiber glass boat firm will sell 1956 model boat molds for Export. Reply Box 2325, Modern Plastics.

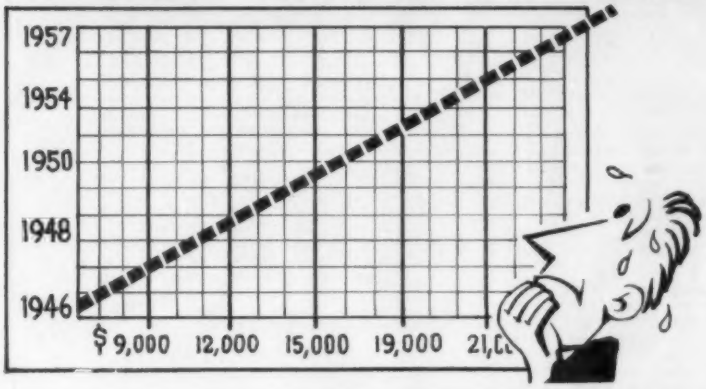
FOR SALE: 12 Cavity (6 set) injection mold for an illuminated Patented Pouring Spout, having a bottle stopper portion provided with a pouring passage. Arranged for a U shaped cradle, bulb and pen light battery that slides in track. A-I condition. M. Jackson, 1200 Lake Shore Drive, Chicago.

Molds wanted

WANTED: Injection molds—one item or complete line of proprietary consumer articles, also interested in molds for industrial parts such as knobs, handles, fasteners, boxes, etc. Will consider purchasing complete injection plant with end products or parts line. Designers: New items wanted—cash or royalty. Victory Mfg. Company, 1722 West Arcade Place, Chicago 12, Ill.—Estab. 1930.

(Continued on page 328)

AS NEW INJECTION PRESS COSTS CLIMB



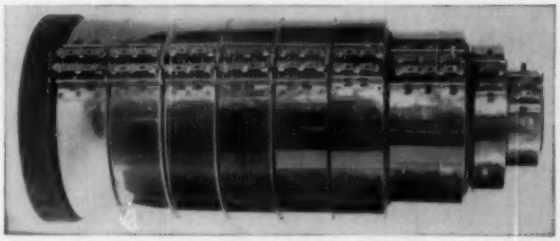
IT BECOMES MORE IMPORTANT THAN EVER TO KNOW JUST HOW MUCH LIFE IS LEFT IN YOUR OLD INJECTION MACHINE

With New Equipment Costs Sky-Rocketing
Smart Molders Are Checking on Overhaul and Modernization

IMS REPLACEMENT HEATING CYLINDERS CAN OFTEN MAKE YOUR OLD PRESSES FULLY COMPETITIVE AGAIN!

Yes — an overhaul, a tune-up, clean oil, and perhaps an extra oil cooler — a few thousand invested in your old press may save you a fortune in new press costs, because old machines can often be made fully competitive again! Let us review your old equipment before you decide to scrap it. We'll tell you just what it will do with an IMS Extra Capacity Superheater in place of the old outdated one — and with New IMS Thermastrip Full Circle Extra Wattage Replacement Heater Bands, of course!

WRITE OR PHONE TODAY!



Illustrated: New IMS Thermastrip Replacement Heaters on IMS Reed-type 10E 16 Replacement Cylinder



Illustrated: New IMS Thermastrip bands showing details of construction, including grooved aluminum shoe and tubular elements.

IMS
INJECTION MOLDERS SUPPLY CO.
3514 LEE ROAD • CLEVELAND 20, OHIO
WYoming 1-1424

Meet Rising Press Costs with IMS EXTRA CAPACITY SUPERHEATERS PLUS. . . .

IMS THERMASTRIP HEATER BANDS

(The Band with the Heat Reservoir — for Even Heat on Cyclical Use)

(Continued from page 326)

Help wanted

COMMISSION REPRESENTATIVE. Manufacturer of thermoformable plastic sheets seeking experienced sales representatives. Desire national coverage on new FIREBAN Aircraft Sheets, also Decorative FIREBAN in woodgrain and fabric finishes. Superior physical characteristics. See feature article, March issue Modern Plastics. Many areas open. Contact Sheet Division, Charles Crowl Company, 11667 McBean Drive, El Monte, California.

EXTRUSION SPECIALIST: Man with knowledge of all phases of the extrusion field, including machine set-up, die, design, ability to handle people. Reply Box 2300, Modern Plastics.

PLASTICS ENGINEER OR MECHANICAL ENGINEER interested in plastics: Excellent opportunity in Southeastern U.S. with well-established company that has recently branched into plastic injection molding and extrusion. Responsibility includes design, alteration and repair of injection molds, and design and cost estimates of new plastic products. Experience desired but not absolutely essential. Replies held in strict confidence. Salary open and excellent fringe benefits provided. Reply Box 2301, Modern Plastics.

PLASTIC FINISHING FOREMAN: Leading Chicago area injection molder requires general foreman for finishing operations, including painting, silk screening, hot stamping, etc.; also assembly. Permanent position for man with experience to operate this expanding department. All replies confidential. Salary and Profit Sharing, commensurate with ability. Reply Box 2322, Modern Plastics.

EXTRUSION PLANT SUPERINTENDENT: Experienced extrusion operator or foreman ready to move up to superintendent for new extrusion company. Must have knowledge of die design and setup on shapes, rods, tubes and sheet. Salary, bonus and fringe benefits, help with moving expenses. New NRM extruders, nice people to work with. Quick Plastics, Jackson, Michigan.

WORKING WIRE FOREMAN: Plastic Extruder, fully experienced in Commercial and Military Spec wire. Excellent Position in California. Teveo Insulated Wire, 119 Prospect Ave., Burbank, California.

AN EXPANDING DIVISION
of an established Midwest chemical manufacturing company's needs:

1. Chemical Sales Representative
   Field assignment will eventually cover Eastern U.S. Individual should have at least two years' experience with vinyl plastics, with one year in the field.
2. Organic Chemist
   Research and development on vinyl plastic applications. Prefer 3-5 years' experience on vinyl plastic applications.

These are permanent positions with excellent growth prospects. Please submit complete details on personal data, education, experience and salary requirements.
Personnel Dept.
The Harshaw Chemical Co.
Cleveland 6, Ohio

PLASTIC SHEET PRODUCTION ENGINEER: Starting salary of $10,500 for energetic man completely experienced in training personnel, setting up, and running plastic sheet department to produce quality high impact styrene sheet. This is a key man position. Employee benefits. Bonus arrangement. Plant location—Florida. In reply, state past background and experience. All replies held confidential. Reply Box 2321, Modern Plastics.

INJECTION MOLD DESIGNER: Opportunity for top man to join one of the industries most progresive custom molding firms. Small town located in south-cental Indiana on the edge of scenic Brown County. Please send complete resume; including experience, education, age, and earnings. All replies held in strict confidence. Reply Box 2326, Modern Plastics.

WANTED: Extrusion set-up man experienced with rigid extrusion of shapes, tubing and rods. Must be able to design dies. Good salary and bonus for right man. Our employees know of this advertisement. Submit detailed resume, all replies confidential. New York Metropolitan area. Box 2312, Modern Plastics.

WANTED: Experienced sales representative, energetic, resourceful—commission basis—for old established firm in Southeast. Territory unrestricted. Primarily for compression and transfer molding. Must be aversed in parts design, various materials, with proper applications. Permissible to have other representations that are not conflicting. Excellent opportunity for right man. Replies held confidential. Reply Box 2306.

PRODUCTION MANAGER—Established mid-west plastics concern has a position available for a Production Manager who has a good background in sheet extrusion, vacuum forming, compression molding and finishing operations. Practical experience should also include mold and die construction and all plant equipment. All replies confidential. Salary open. Box 2307, Modern Plastics.

POLYETHYLENE SALES: Spencer seeks a man with enthusiasm, drive, and a desire for future progress in a plastics sales assignment. Plastic processing experience is desirable but not necessary. Sales experience is also desirable. Location would be East Coast or Mid-west. Excellent opportunity for future advancement exists in a rapidly expanding organization where annual sales have reached $45 million. Please send resume of your experience to: General Sales Manager, Plastics Division, Spencer Chemical Company, Dwight Building, Kansas City, Missouri.

DESIGNERS OF EXTRUSION EQUIPMENT: Here is your chance to get in on the ground floor with an established international machinery builder just entering the plastic field. An exceptional opportunity for the right man. Write giving background and salary requirements. All replies will be handled in confidence. Reply Box 2317, Modern Plastics.

MOLDERS. American Cyanamid Company has several vacancies in its East Coast Development and Technical Service Molding Shops. Technicians or Engineers may qualify with 3-10 years of experience in any, or all of the following: Thermoplastic, Injection Molding, Vacuum Forming, and Extrusion; or Thermosetting Molding. Please submit complete resume including education, experience and salary desired. Daily interviews. AMERICAN CYANAMID CO., 30 Rockefeller Plaza, NY, NY. 63rd fl., CI 7-0100, Ext. 3251.

PLASTIC EXTRUSIONS PARTNER: Expanding extruder seeks partner to manage production. No Capital required for qualified man. Company does custom extruding of special shapes in all materials especially vinyl. Reply Box 2305, Modern Plastics.

PLASTICS APPLICATIONS RESEARCH: A rapidly growing plastic research group offers attractive positions for applications work on plastics and polymers to suitably qualified chemists or chemical engineers with BS or MS degrees. The function of this research is to develop new materials, study fundamental physical properties and assist in the commercial introduction of new products. The positions carry with them a high degree of personal responsibility, including liaison work with different segments of the company. Send resume to Hooker Electrochemical Company, Industrial Relations Department, Niagara Falls, New York.

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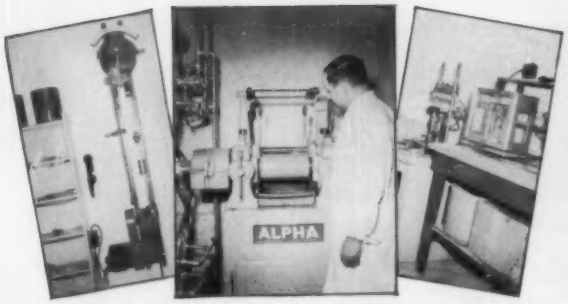
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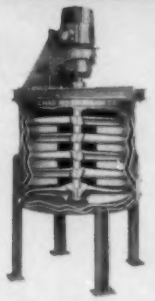
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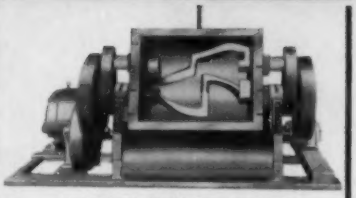
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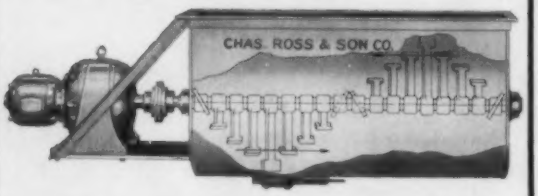


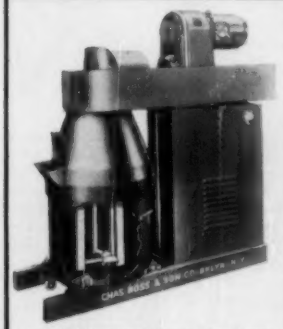
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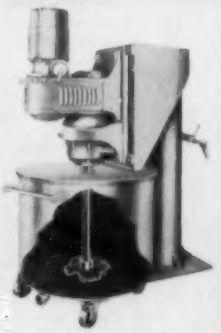
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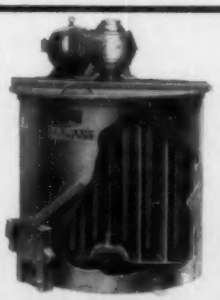




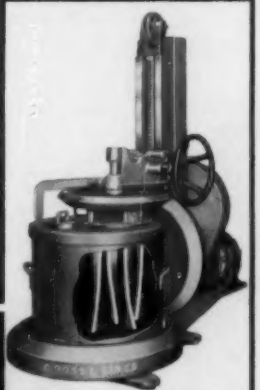
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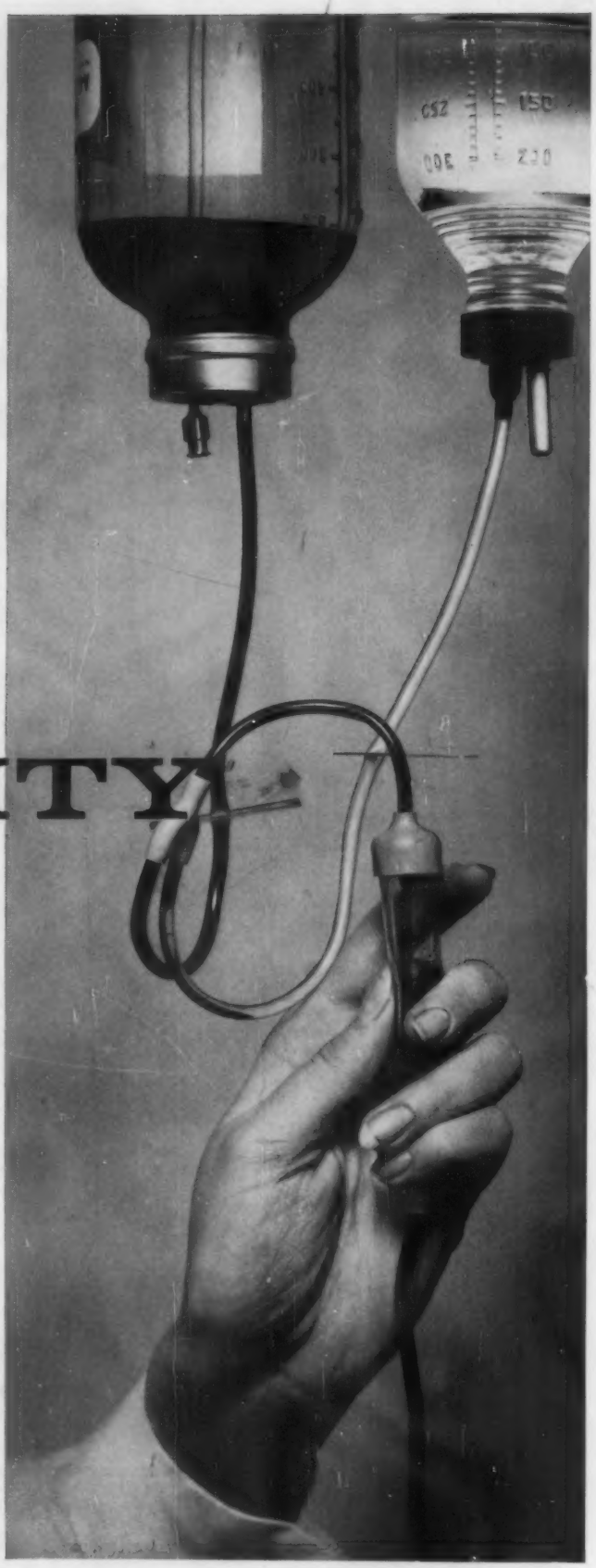
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A word about Diamond PVC *resin*

CLARITY

DIAMOND PVC produces films and extrusions of exceptional quality, uniform color and gloss. This top-quality resin has fine heat stability and dry blends rapidly.

Blended compounds flow freely, even after shipping or storage, because DIAMOND PVC mixes smoothly with plasticizers, stabilizers and lubricants.

DIAMOND PVC's other advantages—speed, economy, uniformity—spell easier processability and top-grade products like the blood transfusion tube at the right.

For information and technical help on processing problems, call your DIAMOND sales office. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, O.

Diamond Chemicals



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permanence and low volatility?	PX-800 PX-120 PX-118 PX-313 (New!)
economy?	PX-114 PX-138 PX-108
low temperature flexibility?	PX-208 PX-404 PX-220 PX-438 PX-238
non-flammability?	PX-917

*Write today for technical data sheets and Pittsburgh's recommendations for solving *your* plasticizer problems.

It's *news* when anyone has a plasticizer problem that can't be solved by a Pittsburgh PX Plasticizer! The breadth and versatility of the line—which includes phthalates, adipates, sebacates, epoxy and TCP—is reason enough to go "*Pittsburgh*" all the way in your plasticizer purchasing.

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Waterbury Companies, Inc. tells how

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For more information about G-E 12920 (black) and G-E 12921 (brown) general purpose compounds, write General Electric Company, Section MP-5, Chemical Materials Dept., Pittsfield, Mass.

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